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Mr. Payson Long
Remedial Bureau E
Section D
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233-7013

ENVIRONMENTAL

Subject:
McKesson Envirosystems Site
400 West Bear Street
Syracuse, New York
Site No. 7-34-020

Date:
September 11, 2014

Contact:
David J. Ulm

Phone:
315.671.9210

Email:
david.ulm@arcadis-us.com

Our ref:
B0026003.2014.00190 #2

Dear Mr. Long:

ARCADIS of New York, Inc. (ARCADIS) has prepared this monitoring memorandum for the McKesson Envirosystems Site (the Site) located at 400 West Bear Street in Syracuse, New York. ARCADIS prepared this memorandum on behalf of McKesson Corporation to describe the groundwater monitoring activities and present the results of the April 2014 monitoring event conducted at the Site in and around Areas 1, 2, and 3 (see Figure 1). This was the fourth monitoring event conducted after the April 10, 2013 shutdown of the in-situ bioremediation treatment and closed loop hydraulic systems, and was conducted as part of a post-shutdown process control monitoring program.

The New York State Department of Environmental Conservation (NYSDEC) approved the shutdown of the Operable Unit No. 2 (OU2) remedial system in a letter dated April 11, 2013 (NYSDEC 2013). The letter required implementation of a post-shutdown process control monitoring program to determine the continued effectiveness of the OU2 remedial action on the remaining contamination (NYSDEC 2013). The post-shutdown monitoring program is a continuation of the constituent of concern (COC) and hydraulic process control monitoring program that has been conducted at the Site since OU2 treatment activities commenced in 1998.

The main objective of this monitoring memorandum, consistent with the previous three memoranda for the monitoring events conducted in July 2013, October 2013, and January 2014 (ARCADIS 2013a, 2014a, and 2014b, respectively), is to provide timely updates of groundwater conditions for monitoring events performed at the Site. This monitoring memorandum provides information about the following:

- Goals of the post-shutdown process control monitoring program
- April 2014 post-shutdown process control monitoring activities
- April 2014 monitoring results
- Data evaluation and conclusions
- Proposed next steps

Goals of the Post-Shutdown Process Control Monitoring Program

The goals of the post-shutdown process control monitoring program are to determine the continued effectiveness of the OU2 remedial action and evaluate the need (if any) to restart remedial processes. As outlined in the October 2013 Periodic Review Report (PRR) (ARCADIS 2013b), the remedial action will be considered to have “continued effectiveness” if COC concentrations meet the following conditions:

- Do not rebound substantially above the pre-shutdown COC concentrations based on an evaluation of the most up-to-date dataset.
- Continue to trend at asymptotic levels.
- Do not migrate beyond the Site boundary above NYSDEC Class GA Groundwater Quality Standards (NYSDEC 1998), as determined by sampling from the sentinel and downgradient perimeter monitoring wells/piezometers.

Additionally, the post-shutdown process control monitoring program provides an evaluation of groundwater flow conditions following the April 2013 shutdown of the closed loop hydraulic system.

April 2014 Post-Shutdown Process Control Monitoring Activities

The fourth post-shutdown process control monitoring event consisted of hydraulic monitoring on April 14, 2014 and COC monitoring from April 14 through 18, 2014. Table 1 identifies each of the hydraulic and COC monitoring locations, which are shown on Figure 1. In addition, the presence or absence of non-aqueous phase liquid (NAPL) was assessed in the monitoring wells and piezometers included in the monitoring program, as well as the collection sump. During this monitoring event, NAPL was not observed in the monitoring wells, piezometers, or the collection sump.

Hydraulic Monitoring

During hydraulic monitoring, groundwater level measurements were obtained at monitoring wells and piezometers that are screened entirely within the sand layer of the shallow hydrogeologic unit and located in and around Areas 1, 2, and 3. Additionally, a groundwater level measurement was obtained within the collection sump, and the Barge Canal surface-water elevation was obtained from measurements taken from a reference point on the Bear Street Bridge, which passes over the canal.

COC Monitoring

The groundwater COCs for the Site are acetone, benzene, toluene, ethylbenzene, xylenes (total), methanol, trichloroethene, aniline, N,N-dimethylaniline, and methylene chloride. Groundwater samples were analyzed for the COCs by TestAmerica Laboratories, Inc. (TestAmerica) in Edison, New Jersey via U.S. Environmental Protection Agency (USEPA) Methods 8260C (volatile organic compounds) and 8270D (semivolatile organic compounds), and in Amherst, New York via Method USEPA 8015D (methanol). TestAmerica is accredited pursuant to the New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program for these analyses. ARCADIS validated the laboratory analytical results using the Tier III full validation process. Attachment A presents copies of the validated analytical laboratory reports associated with the April 2014 monitoring event.

April 2014 Monitoring Results

Hydraulic Monitoring Results

Table 2 presents groundwater level measurements obtained during the April 14, 2014 hydraulic monitoring event, as well as those obtained since October 2006. Figure 2 depicts a potentiometric surface of the Site's shallow hydrogeologic unit using the April 14, 2014 dataset. A comparison of the potentiometric surface maps generated during the four post-shutdown process control monitoring events, demonstrates that hydraulic conditions have remained consistent following the April 2013 shutdown of the closed loop hydraulic system in Area 3.

When comparing the April 2014 potentiometric surface map to those maps generated (and presented in previous PRRs) using groundwater elevation data obtained prior to system shutdown, the following conclusions, as presented in the first monitoring memorandum (ARCADIS 2013a), remain true:

- The closed depression around the groundwater withdrawal trench is no longer present.

- The potentiometric surface of the shallow hydrogeologic unit sand layer following the April 2013 system shutdown is generally consistent with the potentiometric surface prior to the 1998 implementation of the closed loop hydraulic system in Area 3.

COC Monitoring Results

COC groundwater analytical results are summarized in Table 3 and shown on Figures 3 and 4. COC groundwater analytical results are compared to the NYSDEC Groundwater Quality Standards presented in the Technical and Operational Guidance Series 1.1.1 (NYSDEC 1998). The April 2014 COC results are consistent with those obtained following the April 2013 shutdown of the in-situ bioremediation treatment system, as well as those obtained prior to shutdown. Concentrations for most of the COCs were either not detected or were below their respective NYSDEC Class GA Groundwater Quality Standards in each area.

The analytical results for the April 2014 COC monitoring event are summarized below for each area (Areas 1, 2, and 3), as well as for sentinel and downgradient perimeter monitoring locations.

Area 1

At the five monitoring locations in Area 1 (MW-9S, MW-31, MW-32, MW-33, and TW-01), four COCs (benzene, xylenes, N,N-dimethylaniline, and ethylbenzene) were detected at concentrations slightly exceeding their respective standards (see Table 3 and Figure 3).

Area 2

At the four monitoring locations in Area 2 (MW-34, MW-35, TW-02RRR, and MW-36R), four COCs (acetone, benzene, aniline, and N,N-dimethylaniline) were detected at concentrations above their respective standards (see Table 3 and Figure 3).

Area 3

At three out of the five monitoring locations in Area 3 (MW-27, MW-29, and MW-30), all COC concentrations were non-detect or below their respective standards. At the remaining two monitoring locations (MW-28 and MW-8SR), four COCs (benzene, xylenes, aniline, and N,N-dimethylaniline) were detected at concentrations that slightly exceeded their respective standards (see Table 3 and Figure 4).

Sentinel Wells

COCs were not detected at sentinel wells MW-3S and MW-4S, located downgradient of Area 1 (Table 3 and Figure 3).

Downgradient Perimeter Wells/Piezometers

COCs were not detected in any of the downgradient perimeter/monitoring locations (MW-17R, MW-18, MW-23I, MW-23S, and PZ-4D), except methanol, which was detected at MW-17R (see Table 3 and Figure 4). This detection of methanol at MW-17R is considered anomalous. There is no NYSDEC Class GA Groundwater Quality Standard for methanol.

PZ-4S was not sampled during the April 2014 monitoring event because it is included in the COC monitoring program every second monitoring event. PZ-4S was last sampled in January 2014.

Data Evaluation and Conclusions

To evaluate the continued effectiveness of the OU2 remedial action and the need (if any) to restart the remedial process, April 2014 data were incorporated into the historical groundwater dataset (1998 through April 2014) for technical analyses. The technical analyses performed were the same as those detailed in the January 2013 PRR (ARCADIS 2013c) and are described in Attachment B. The technical analyses consisted of the following:

- Change in annual total COC molar concentration (i.e., concentration normalized by its molecular weight) over time.

- Statistical analyses that included first order decay functions and regression analyses between time (year) and percent COC reduction fitted to each area's annual total COC molar concentration.

The data and results from these technical analyses, as presented in Attachment B, demonstrate that the OU2 remedial action has continued effectiveness, showing that the remedy continues to: (1) be protective of public health and the environment, (2) comply with the OU2 Record of Decision (NYSDEC 1997), and (3) meet remedial process closure requirements in Section 6.4 of Division of Environmental Remediation-10: Technical Guidance for Site Investigation and Remediation (NYSDEC 2010a). The conclusions developed based on groundwater data obtained from 1998 through April 2014 are summarized below:

- COC concentrations detected in April 2014 did not rebound above pre-shutdown COC concentrations.

- COC concentrations were mostly not detected or below their respective NYSDEC Class GA Groundwater Quality Standard in each Area during the April 2014 monitoring event.

- COC concentrations continue to trend at asymptotic levels for each area.

- COC concentrations have not migrated beyond the Site boundary above NYSDEC Groundwater Quality Standards.

- The remedy continues to achieve the bulk of reduction of groundwater contamination, as indicated by total COC molar concentrations exceeding 98.5 percent reduction in each area.

These conclusions confirm that groundwater quality conditions have not substantially changed since the shutdown of the in-situ bioremediation treatment and closed loop hydraulic systems and fully demonstrate the continued effectiveness of the OU2 remedial action. Accordingly, there is no need to restart the remedial processes.

Proposed Next Steps

As also outlined in the October 2013 PRR (ARCADIS 2013b), the post-shutdown process control monitoring program is proposed to be conducted for 2 years (2013 to 2015), consisting of quarterly monitoring during the first year and biannual monitoring during the second year. The first year of quarterly monitoring has been completed, with results consistently demonstrating the continued effectiveness of the OU2 remedial action, indicating no need to restart the remedial processes (i.e., in-situ bioremediation treatment and closed loop hydraulic systems). The first biannual post-shutdown process control monitoring event is planned to occur in October 2014 and will consist of hydraulic and COC monitoring similar to that conducted in April 2014. As detailed in Table 1, the October 2014 monitoring event will consist of measuring groundwater/surface-water elevations at the locations identified with an “H” and collecting groundwater samples from the monitoring wells/piezometers identified with a “C”, except for MW-4S, which will continue to be included in the COC monitoring program every third monitoring event.

Following the October 2014 monitoring event, the data will be evaluated to determine the continued effectiveness of the remedial action. The October 2014 groundwater monitoring activities and results, in addition to an overall evaluation of post-shutdown groundwater conditions and proposed next steps, will be documented in a monitoring memorandum, which will be submitted to the NYSDEC prior to the second biannual post-shutdown process control monitoring event planned for April 2015.

If you have any questions or require additional information, please contact me at 315.671.9210.

Sincerely,

ARCADIS of New York, Inc.

David J. Ulm
Senior Vice President

AS/lar

Copies:
Ms. Susan Edwards, NYSDEC (w/out Attachment A)
Mr. Harry Warner, NYSDEC (w/out Attachment A)
Mr. Richard Jones, NYSDOH (w/out Attachment A)
Margaret A. Sheen, Esq., NYSDEC (w/out Attachment A)
Ms. Jean Mescher, McKesson Corporation (w/out Attachment A)
Mr. Douglas Morrison, Bristol-Myers Squibb Company (w/out Attachment A)
Christopher Young, P.G., de maximis, inc. (w/out Attachment A)
Kevin Bernstein, Esq., Bond Schoeneck & King PLLC (w/out Attachment A)

Enclosures:

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Figure 1	Site Plan
Figure 2	Potentiometric Surface of the Shallow Hydrogeologic Unit Sand Layer April 14, 2014
Figure 3	Groundwater Monitoring Data Summary for April 2010 – April 2014, Areas 1 & 2
Figure 4	Groundwater Monitoring Data Summary for April 2010 – April 2014, Area 3

Attachments

Attachment A	Validated Analytical Laboratory Reports
Attachment B	Statistical Analyses

References

ARCADIS. 2013a. Monitoring Memo – July 2013 Monitoring Event. McKesson Envirosystems Former Bear Street Facility. October 18.

ARCADIS. 2013b. Periodic Review Report. McKesson Envirosystems Former Bear Street Facility. October 1.

ARCADIS. 2013c. Periodic Review Report. McKesson Envirosystems Former Bear Street Facility. January 15.

ARCADIS. 2014a. Monitoring Memo – October 2013 Monitoring Event. McKesson Envirosystems Former Bear Street Facility. January 3.

ARCADIS. 2014b. Monitoring Memo – January 2014 Monitoring Event. McKesson Envirosystems Site. April 11.

NYSDEC. 1997. Record of Decision for McKesson Envirosystems Inactive Hazardous Waste Disposal Site, OU2. March 19.

NYSDEC. 1998. Technical Operational Guidance Series 1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June. Available online at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

NYSDEC. 2010a. Division of Environmental Remediation-10: Technical Guidance for Site Investigation and Remediation (DER-10). May 3. Available online at: http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf

NYSDEC. 2010b. Letter from Payson Long, NYSDEC, to David Ulm, ARCADIS. RE: Requested Changes in Remedial Monitoring Program. September 23.

NYSDEC. 2013. Letter from Payson Long, NYSDEC, to Jean Mescher, McKesson Corporation. RE: Discontinuation of Remedial Processes. April 11.

Tables

Table 1. Post-Shutdown Process Control Monitoring Wells and Piezometers
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

Monitoring Location	Purpose of Monitoring
Sentinel	
MW-3S*	C
MW-4S*	C
Area 1	
TW-01	C
MW-9S	C
MW-31	C
MW-32	C
MW-33*	C
PZ-F	H
PZ-G	H
PZ-HR	H
PZ-P	H
PZ-Q	H
PZ-R	H
PZ-S	H
Area 2	
TW-02RRR	C
MW-34	C
MW-35	C
MW-36R*	C
PZ-I	H
PZ-J	H
PZ-T	H
PZ-U	H
PZ-V	H
Area 3	
MW-8SR*	C
MW-11S	H
MW-27*	C
MW-28	C
MW-29*	C
MW-30*	C
PZ-A	H
PZ-B	H
PZ-C	H
PZ-D	H
PZ-E	H
PZ-K	H
PZ-L	H
PZ-M	H
PZ-N	H
PZ-O	H
Collection Sump	H
Downgradient Perimeter	
MW-17R	C
MW-18	C
MW-23I	C
MW-23S	C, H
MW-24SR	H
MW-25S	H
PZ-4S*	C
PZ-4D*	C, H
PZ-5D	H
Barge Canal	H

See Notes on Page 2.

Table 1. Post-Shutdown Process Control Monitoring Wells and Piezometers
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

Notes:

1. The table lists the monitoring wells and piezometers that are part of the constituent of concern (COC) and/or hydraulic post-shutdown process control monitoring program.
2. Hydraulic monitoring involves obtaining groundwater level measurements from monitoring wells/piezometers identified in the table and surface-water level measurements from the Barge Canal. The surface-water level of the Barge Canal is measured from a demarcated reference point on the Bear Street Bridge, which crosses over the canal. Groundwater elevation data are used to map potentiometric surface of the shallow hydrogeologic unit sand layer.
3. The COCs are acetone, benzene, ethylbenzene, methylene chloride, toluene, trichloroethene, xylenes, aniline, N,N-dimethylaniline, and methanol.
4. Monitoring well MW-4S and piezometer PZ-4S are included in the COC monitoring program every third and second monitoring event, respectively.

C = COC monitoring.
H = hydraulic monitoring.
* = New York State Department of Environmental Conservation approved the elimination of methanol analysis from the COC groundwater monitoring program (NYSDEC 2010b).

Table 2. Summary of Groundwater Level Measurements, October 2006 through April 2014
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

Location	Reference Elevation (feet AMSL)	10/30/06	6/6/07	11/12/07	3/24/08	8/25/08	3/23/09	9/14/09	4/26/10	10/11/10	4/4/11
Barge Canal[A]	393.39	364.29	362.99	362.06	364.34	363.21	363.54	362.89	362.97	363.49	362.07
Collection Sump	372.81	363.18	362.26	361.86	363.81	362.14	362.20	362.18	362.18	360.72	359.90
MW-3S[B]	376.54	369.08	--	367.60	367.93	365.19	367.32	365.50	365.67	367.95	369.21
MW-11S	373.50	366.11	364.27	363.88	365.69	363.86	364.88	363.89	364.42	364.30	365.00
MW-18[B]	372.57	363.82	362.63	362.32	363.51	362.26	363.16	362.22	362.67	362.87	363.82
MW-23I[B]	372.77	366.43	365.02	364.74	366.12	364.64	365.69	364.67	365.19	365.38	366.57
MW-23S	372.61	365.28	362.98	362.56	364.81	362.62	363.50	362.63	362.99	362.71	364.57
MW-24SR	375.55	366.49	365.21	364.83	366.26	364.73	365.81	364.79	365.32	365.81	366.60
MW-25S	373.39	365.26	363.32	362.87	364.84	362.88	363.97	362.89	363.34	363.30	364.10
PZ-4D	376.11	366.64	365.29	364.98	366.39	364.90	365.96	364.94	365.49	366.02	366.74
PZ-5D	375.58	366.87	365.49	365.19	366.69	365.09	366.21	365.14	365.01	366.09	366.99
PZ-A	373.94	365.62	363.11	362.72	364.83	362.96	363.56	362.95	362.28	362.35	362.68
PZ-B	373.92	365.85	363.12	362.62	365.03	362.87	363.64	362.83	362.96	362.22	363.24
PZ-C	374.85	367.14	365.85	365.30	367.15	365.16	366.71	365.23	366.37	367.11	367.88
PZ-D	375.12	367.68	365.98	365.40	367.29	365.28	366.81	365.40	366.57	367.17	368.20
PZ-E	374.12	368.13	365.16	364.07	366.58	364.14	366.82	364.20	364.25	364.16	364.83
PZ-F	377.06	368.32	366.18	365.76	367.99	365.50	367.41	365.69	366.72	367.10	368.10[B]
PZ-G	377.16	368.64	366.28	365.82	368.14	365.94	367.29	367.22	367.32	367.36	368.12
PZ-HR	376.99	368.31	366.23	365.74	368.00	365.48	367.41	365.63	366.65	367.15	368.00[B]
PZ-I	375.15	369.00	366.49	365.92	368.55	365.50	367.97	365.71	367.04	367.49	368.60
PZ-J	374.89	367.96	366.16	365.82	367.69	365.55	367.20	365.70	366.55	367.05	367.81
PZ-K	373.19	365.58	363.36	362.91	364.96	363.08	363.80	363.04	363.33	363.34	361.94
PZ-L	374.62	365.23	362.94	362.63	364.64	362.79	363.39	362.80	363.80	362.36	362.52
PZ-M	374.35	365.60	363.54	363.11	365.13	363.30	364.00	363.31	363.62	363.04	363.47
PZ-N	376.94[C]	367.51	365.76	365.26	367.05	365.09	366.63	365.17	366.22	367.01	367.79
PZ-O	375.36	365.42	363.22	362.82	365.01	362.91	363.94	362.93	363.35	362.90	363.57
PZ-P	376.89	368.30	366.31	365.83	368.06	365.58	367.51	365.75	366.76	367.26	368.08
PZ-Q	377.61	368.61	366.33	365.83	368.23	365.57	367.61	365.77	366.78	367.26	368.13
PZ-R	377.05	368.51	366.19	365.79	368.20	365.55	367.57	365.73	366.74	367.24	368.10
PZ-S	378.13	372.48	366.51	365.81	368.21	365.55	367.60	365.74	366.76	367.13	369.67[B]
PZ-T	376.25	368.04	366.24	365.84	367.89	365.52	367.37	365.66	366.63	367.12	367.94
PZ-U	375.35	367.99	366.07	365.80	367.75	365.52	367.25	365.66	366.52	367.05	367.83
PZ-V	375.78	367.97	366.17	365.78	367.78	365.48	367.24	365.64	366.52	367.04	367.81

See Notes on Page 2.

Table 2. Summary of Groundwater Level Measurements, October 2006 through April 2014
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

Location	Reference Elevation (feet AMSL)	10/24/11	4/9/2012	10/1/2012	4/1/2013	7/18/2013[D]	10/17/2013[D]	1/17/2014[D]	4/14/2014[D]
Barge Canal[A]	393.39	363.71	358.39	360.59	360.74	360.69	360.69	361.38	362.29
Collection Sump	372.81	361.33	360.95	361.70	361.24	364.71	364.84	366.14	366.92
MW-3S[B]	376.54	--	366.44	365.15	367.55	366.11	366.62	367.83	368.66
MW-11S	373.50	364.18	363.92	363.62	364.42	364.95	365.08	366.08	366.94
MW-18[B]	372.57	--	362.57	362.32	362.85	362.74	363.54	363.57	364.50
MW-23I[B]	372.77	--	364.99	364.73	365.29	365.23	365.33	366.02	366.86
MW-23S	372.61	362.66	362.23	362.29	362.88	364.20	364.37	365.30	366.06
MW-24SR	375.55	365.63	365.09	364.84	365.48	365.39	365.46	366.25	367.09
MW-25S	373.39	363.17	362.81	362.61	363.48	364.08	364.23	365.14	365.89
PZ-4D	376.11	365.78	365.24	364.94	365.59	365.47	365.59	366.34	367.06
PZ-5D	375.58	366.02	365.48	365.16	365.84	365.67	365.81	366.57	367.42
PZ-A	373.94	362.53	363.24	362.54	362.68	364.78	364.92	366.08	366.87
PZ-B	373.92	362.47	362.14	362.35	362.64	364.77	364.88	366.08	366.86
PZ-C	374.85	366.6	366.10	365.41	366.76	365.75	365.84	366.65	367.50
PZ-D	375.12	366.87	366.39	365.65	367.07	365.87	365.97	366.82	367.66
PZ-E	374.12	364.18	363.67	363.35	364.38	365.12	365.22	366.44	367.22
PZ-F	377.06	367.04	366.46	365.44	366.91	366.52	366.57	367.61	368.66
PZ-G	377.16	367.17	366.53	365.48	367.04	366.67	366.70	367.74	368.74
PZ-HR	376.99	367.04	366.40	365.38	366.90	366.46	366.50	367.61	368.60
PZ-I	375.15	367.47	366.77	365.36	367.52	366.60	366.70	368.20	369.15
PZ-J	374.89	366.94	366.30	365.55	366.74	366.39	366.48	367.50	368.37
PZ-K	373.19	362.97	362.65	362.75	363.03	364.79	364.96	365.97	366.77
PZ-L	374.62	362.54	362.16	362.42	362.60	364.61	364.77	365.90	366.71
PZ-M	374.35	363.22	362.86	362.87	363.28	364.93	364.96	366.18	366.98
PZ-N	376.94[C]	366.62	366.06	365.33	366.72	365.67	365.81	366.57	367.46
PZ-O	375.36	362.94	362.61	362.52	363.14	364.50	364.64	365.72	366.48
PZ-P	376.89	367.15	366.49	365.45	366.93[B]	366.57	366.63	367.69	368.69
PZ-Q	377.61	367.21	366.52	365.44	367.04	366.59	366.65	367.76	368.80
PZ-R	377.05	367.15	366.48	365.45	367.03	366.54	366.59	367.74	368.75
PZ-S	378.13	367.48	366.51	365.45	367.34[B]	366.58	366.61	368.27	369.73
PZ-T	376.25	367.00	366.32	365.41	366.86	366.42	366.49	367.64	368.55
PZ-U	375.35	366.92	366.29	365.44	366.77	366.38	366.47	367.55	368.42
PZ-V	375.78	366.93	366.28	365.40	366.77	366.37	366.46	367.53	368.44

Notes:

[A]Surface-water level measurements are obtained from the Barge Canal. The surface-water level is measured from a demarcated reference point on the Bear Street Bridge, which crosses over the canal.

[B]Data not used in potentiometric surface mapping of the shallow hydrogeologic unit sand layer.

[C]The reference elevation for PZ-N was 376.02 feet AMSL prior to November 16, 2000. The new reference elevation is 376.94 feet AMSL.

[D]Groundwater elevations reflect hydrogeologic conditions after the April 2013 shutdown of the *in-situ* bioremediation treatment and closed loop hydraulic systems.

Abbreviations:

AMSL = above mean sea level (National Geodetic Vertical Datum of 1929).

-- = Not Measured.

Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
MW-3S	3/09	365.1	350.1	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10	**0.17 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	4/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3 J	<1.1 J	NA
	10/11			<10	<1.0	<1.0	<1.0	0.35 J	<1.0	<3.0	<5.0	<1.0	NA
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	NA
	10/12			<10	**0.27 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.61 J	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	NA
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	NA
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA
MW-4S	10/10	365.5	350.5	<10 [<10]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<3.0 [<3.0]	<5.0 [<5.0]	<1.0 [<1.0]	<500 J [<500 J]
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	NA
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	NA
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA
MW-8SR[B]	3/09	362.7	352.7	**6.5 J [5.8 J]**	**6.8 [6.8]**	**66 [63]**	<1.0 [<1.0]	**10 [10]**	<1.0 [<1.0]	**140 [140]**	**2,200 [1,800]**	<12 [<12]	<500 [<500]
	6/09			NA	NA	NA	NA	NA	NA	NA	**7,000**	<50	NA
	9/09			**<10 [8.3 J]**	**8.5 J [7.9]**	**44 J [38]**	<1.0 [<1.0]	**6.8 J [6.5]**	<1.0 J [<1.0]	**81 J [71]**	**4,000 [3,400]**	<20 [<20]	<500 [<500]
	4/10			<10 [<10]	**4.2 [3.5]**	**23 J [18]**	<1.0 [<1.0]	**4.6 [3.7]**	<1.0 [<1.0]	**41 [33]**	**370 J [720 J]**	**1.0 J [<5.0]**	<500 [<500]
	10/10			<10	**2.7**	**16**	<1.0	**2.0**	<1.0	**31**	**220**	**1.6**	NA
	4/11			**5.9 J [4.3 J]**	**3.2 [3.2]**	**10 [8.8]**	<1.0 [<1.0]	**2.8 [2.6]**	<1.0 [<1.0]	**32 [31]**	**57 J [64]**	**1.5 [1.6]**	NA
	10/11			<10 [<10]	**1.9 [2.0]**	**2.0 [2.1]**	<1.0 [<1.0]	**1.3 [1.3]**	<1.0 [<1.0]	**14 [15]**	<5.0 [<5.0]	**2.6 [<1.0]**	NA
	4/12			**8.7 J [6.7 J]**	**1.2 [1.7]**	**2.3 [3.3]**	<0.18 [<0.18]	**0.76 J [1.2]**	<0.090 [<0.090]	**9.5 [15]**	<1.9 [<1.9]	**2.4 [2.6]**	NA
	10/12			<10 [<10]	**0.69 J [0.70]**	**0.16 J [0.14 J]**	<1.0 [<1.0]	**0.36 J [0.39 J]**	<1.0 [<1.0]	**1.4 J [1.2 J]**	<5.3 [<5.0]	**2.3 [2.7]**	NA
	4/13			<10 [<10]	**1.1 [1.1]**	**0.32 J [0.28 J]**	<1.0 [<1.0]	**0.67 J [0.68 J]**	<1.0 [<1.0]	**7.7 [8.0]**	<5.1 [<5.1]	**1.7 [1.4]**	NA
	7/13			**5.1 J [8.7 J]**	**1.9 [1.8]**	**0.17 J [0.18 J]**	<1.0 [<1.0]	**1.0 [0.96J]**	<1.0 [<1.0]	**11 [9.4]**	**2.5 [2.5]**	**0.89 J [0.96 J]**	<1,000 [<1,000]
	10/13			<10	**2.9**	**0.21 J**	<1.0	**1.3**	<1.0	**13**	**2.6 J**	**0.83 J**	NA
	1/14			<10 J [<10 J]	**2.4 [2.6]**	**0.19 J** [<1.0]	<1.0 [<1.0]	**0.94 J [1.1]**	<1.0 [<1.0]	**11 [13]**	**5.1 J** [<10]	**2.0 [1.7]**	NA
	4/14			<10 [<10]	**3.2 [3.3]**	**0.25 J [0.27 J]**	<1.0 [<1.0]	**1.2 [1.1]**	<1.0 [<1.0]	**13 [13]**	**3.9 J [5.6 J]**	**1.4 [1.9]**	NA
MW-9[C] (Replaced by MW-9S)	3/09	365.6	356	<10	**1.2**	**27**	<1.0	**2.5**	<1.0	**65**	<5.0	**4.2**	<500
	9/09			<10	**1.7**	**20**	<1.0	**2.2**	<1.0	**70**	<5.0	**4.1**	**730**
	4/10			<10	**0.86 J**	**26**	<1.0	**2.1**	<1.0	**69**	<5.0	**6.5**	<500
	10/10			<10	**1.3**	**11**	<1.0	**1.9**	<1.0	**45**	<5.1	**7.5**	<500 J
	4/11			<10	**0.91 J**	**29**	<1.0	**2.6**	<1.0	**89**	<5.3	**5.4**	<500
	10/11			<10	**1.2**	**4.2**	<1.0	**1.8**	<1.0	**41 J**	<5.0	**7.6**	<500
	4/12			**7.5 J**	**1.1**	**18**	<0.18	**1.5**	<0.090	**67**	<1.9	**6.3**	<500
	10/12			<10	**1.9 J**	**4.7**	<1.0	**3.2**	<1.0	**84**	<5.0	**3.9**	NA
	4/13			**12 J**	**0.95 J**	**19**	<1.0	**1.6**	<1.0	**62**	<5.1	**5.9**	<1,000
	7/13			<10	**1.9**	**12**	<1.0	**2.0**	<1.0	**45**	<1.0	**2.0**	<1,000
	10/13			<5.0	**2.9**	**10**	<1.0	**2.6**	<1.0	**60**	<5.0	**5.2**	<500
	1/14			<10 J	**1.1**	**13**	<1.0	**1.6**	<1.0	**54**	<10	**7.2**	<500
	4/14			<10	**1.0**	**19**	<1.0	**2.2**	<1.0	**74**	<10	**5.7**	<500

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Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
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Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Screen Elev. (feet AMSL) Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
MW-17[D]	3/09	365.7	356.1	<10	**2.3**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
(Replaced by MW-17R)	9/09			<10 J	**0.86 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	4/10			<10	**0.22 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	10/10			<10	**1.3**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.6	<1.1	<500 J
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3 J	<1.1 J	<500
	10/11			<10	<1.0	<1.0	<1.0	**0.19 J**	<1.0	<3.0 J	<5.0	<1.0	<500
	4/12			<2.7	**0.22 J**	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	<500
	10/12			<10	**0.55 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	<1,000
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.2	<1.2	<1,000
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.4	<1.1	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	**2,700**
MW-18	3/09	325.15	316.15	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	4/10			<10	<1.0	<1.0	**33**	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	6/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	NA	NA	NA
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	<500 J
	4/11			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	<500
	10/11			<10	<1.0	<1.0	<1.0	**0.23 J**	<1.0	<3.0 J	<5.0	<1.0	<500
	4/12			<2.7	<0.080	<0.10	<0.18	**0.27 J**	<0.090	<0.36	<1.8	<0.21	<500
	10/12			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	4/13			<10	<1.0	<1.0	<1.0	**0.60 J**	<1.0	<3.0	<4.8	<0.95	<1,000
	7/13			<10	<1.0	<1.0	<1.0	**0.25 J**	<1.0	<3.0	<1.0	<1.0	<1,000
	10/13			<10	<1.0	<1.0	<1.0	**0.19 J**	<1.0	<3.0	<5.4	<1.1	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
MW-23S	3/09	364.1	354.1	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	4/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	10/10			**3.7 J**	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500 J
	4/11			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	<500
	10/11			<10	<1.0	<1.0	<1.0	**0.31 J**	<1.0	<3.0	<5.0	<1.0	<500
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	<500
	10/12			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	<1,000
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1,000
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500

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Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
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Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
MW-23I	3/09	341.2	336.2	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	4/10			<10	<1.0	<1.0	**8.4**	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	6/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	NA	NA	NA
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500 J
	4/11			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	<500
	10/11			<10	<1.0	<1.0	<1.0	**0.29 J**	<1.0	<3.0	<5.0	<1.0	<500
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	<500
	10/12			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.6	<1.1	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<4.8	<9.5	<1,000
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	<1,000
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
MW-27	3/09	362.5	354.5	**14 J**	**8.7**	**36**	<1.0	**9.4**	<1.0	**88**	**8,200 J**	<50 J	<500
	6/09			NA	NA	NA	NA	NA	NA	NA	**7,400**	<50	NA
	9/09			**10**	**6.2**	**5.9**	<1.0	**6.9**	<1.0	**23**	**2,100**	<10	<500
	4/10			<10	**4.5**	**6.1**	<1.0	**2.4**	<1.0	**10**	**1,300**	<10	<500
	10/10			<10	**2.7**	**1.4**	<1.0	**1.3**	<1.0	**3.4**	**220**	**2.5**	NA
	4/11			**3.9 J**	**3.1**	**5.1**	<1.0	**5.7**	<1.0	**9.1**	**1,000**	<11	NA
	10/11			<10	**2.1**	**2.2**	<1.0	**1.3**	<1.0	**3.1**	**36**	**2.7**	NA
	4/12			<2.7	**1.5**	**1.4**	<0.18	**0.45 J**	<0.090	**2.2 J**	<1.9	**2.7**	NA
	10/12			<10	**1.1**	<1.0	<1.0	**0.22 J**	<1.0	<3.0	<5.0	**2.2**	NA
	4/13			<10	**1.1**	**0.88 J**	<1.0	**0.34 J**	<1.0	**1.4 J**	11	**2.4**	NA
	7/13			<10	**2.0**	<1.0	<1.0	**0.60 J**	<1.0	<3.0	**1.5**	**1.1**	<1,000
	10/13			<10	**2.6**	<1.0	<1.0	**0.75 J**	<1.0	**3.9**	<5.0	**0.73 J**	NA
	1/14			<10 J	**0.89 J**	<1.0	<1.0	**0.33 J**	<1.0	**0.22 J**	<12	**0.75 J**	NA
	4/14			<10	**1.0**	<1.0	<1.0	**0.41 J**	<1.0	**0.92 J**	**0.60 J**	**0.48 J**	NA
MW-28	3/09	363.6	355.6	<10	**3.5**	**0.8 J**	<1.0	**0.3 J**	<1.0	**1.1 J**	**18**	<0.5	**851**
	9/09			<10	**3.1**	**0.32 J**	<1.0	**0.25 J**	<1.0	**0.48 J**	**6.7**	<1.0	<500
	4/10			<10	**2.8**	**0.60 J**	<1.0	**0.23 J**	<1.0	**0.46 J**	<5.0	**0.49 J**	<500
	10/10			<10	**1.8**	<1.0	<1.0	<1.0	<1.0	<3.0	**2.4 J**	**0.60 J**	<500 J
	4/11			**4.3 J**	**2.3**	<1.0	<1.0 B	**0.11 J**	<1.0	<3.0	**3.9 J**	**0.75 J**	<500
	10/11			<10	**1.8**	<1.0	<1.0	**0.38 J**	<1.0	<3.0	<5.0	<1.0	<500
	4/12			<2.7	**1.4**	<0.10	<0.18	**0.22 J**	<0.090	<0.36	<1.8	**0.48 J**	<500
	10/12			<10	**1.9**	<1.0	<1.0	**0.16 J**	<1.0	<3.0	<5.0	**0.62 J**	NA
	4/13			<10	**1.7**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	**0.32 J**	**410 J**
	7/13			<10	**1.7**	<1.0	<1.0	**0.22 J**	<1.0	<3.0	<1.0	**0.35 J**	<1,000
	10/13			<10	**1.7**	<1.0	<1.0	**0.49 J**	<1.0	**0.68 J**	<5.0	**0.70 J**	<500
	1/14			<10 J	**1.2**	<1.0	<1.0	**0.22 J**	<1.0	<3.0	<10	**0.75 J**	<500
	4/14			**13**	**1.7**	<1.0	<1.0	**0.29 J**	<1.0	<3.0	<10	**0.72 J**	<500

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Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
MW-29	3/09	362.9	345.9	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10	<1.0	<1.0	<1.0	**0.16 J**	<1.0	<3.0	<5.0	**0.29 J**	<500
	4/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3 J	<1.1 J	NA
	10/11			<10	<1.0	<1.0	<1.0	**0.22 J**	<1.0	<3.0 J	<5.0	**0.22 J**	NA
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	NA
	10/12			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	NA
	7/13			<10	**0.26 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	NA
	10/13			<10	**0.32 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<11	<1.1	NA
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA
MW-30	3/09	363.5	355.5	<10	**0.8 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10	**0.78 J**	<1.0	<1.0	**0.17 J**	<1.0	<3.0	**21**	<1.0	<500
	4/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	10/10			<10 J	**0.14 J**	<1.0	**37**	<1.0	<1.0	<3.0	<5.1	<1.0	NA
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3 J	<1.1 J	NA
	10/11			<10	<1.0	<1.0	<1.0	**0.18 J**	<1.0	<3.0 J	<5.0	<1.0	NA
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	NA
	10/12			<10	**0.099 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	7/13			<10	**0.20 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	**0.30 J**	NA
	10/13			<10	**0.29 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	**0.85 J**	NA
	1/14			<10 J	**0.19 J**	<1.0	<1.0	<1.0	<1.0	**0.14 J**	<11	<1.1	NA
	4/14			<10	**0.37 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**0.43 J**	NA
MW-31	3/09	363.7	355.4	**9.4 J**	**8.3**	< 1.0	<1.0	**0.6 J**	<1.0	**0.8 J**	<5.0	**2.3**	<500
	9/09			<10	**10**	<1.0	<1.0	**0.49 J**	<1.0	**2.0 J**	<5.0	**2.5**	**730**
	4/10			<10	**4.8**	<1.0	<1.0	**0.40 J**	<1.0	**1.3 J**	<5.0	**2.3**	<500
	10/10			<10	**6.9**	<1.0	<1.0	**0.50 J**	<1.0	**1.5 J**	<5.3	**3.5**	<500 J
	4/11			<10	**8.3**	<1.0	<1.0	**0.77 J**	<1.0	**2.5 J**	<5.3	**2.3**	<500
	10/11			<10	**5.7**	<1.0	<1.0	**0.62 J**	<1.0	**1.5 J**	<5.0	**3.5**	<500
	4/12			**6.5 J**	**6.8**	**0.16 J**	<0.18	**0.65 J**	<0.090	**2.7 J**	<1.9	**2.1**	<500
	10/12			<10	**6.3 J**	**0.16 J**	<1.0	**0.44 J**	<1.0	**2.3 J**	<5.0	**0.90 J**	NA
	4/13			<10	**12**	**0.21 J**	<1.0	**1.3**	<1.0	**5.6**	<5.2	**1.1**	<1,000
	7/13			<10	**11**	<1.0	<1.0	**1.2**	<1.0	**5.1**	**0.72 J**	**1.6**	<1,000
	10/13			<10	**11**	**0.15 J**	<1.0	**1.4**	<1.0	**6.1**	<5.2	**2.2**	<500
	1/14			<10 J	**8.2**	<1.0	<1.0	**1.2**	<1.0	**6.3**	<10	**2.2**	NA
	4/14			<10	**7.5**	**0.22 J**	<1.0	**0.93 J**	<1.0	**4.6**	**0.75 J**	**1.9**	<500

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Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
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Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
MW-32	3/09	364	356	<10	**0.5 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**1.1**	**1,200**
	4/10			<10	**0.23 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**0.89 J**	<500
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	**0.87 J**	<500 J
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	<500
	10/11			<10	<1.0	<1.0	<1.0	**0.19 J**	<1.0	<3.0 J	<5.0	**1.5**	<500
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	**1.1**	<500
	10/12			<10	<1.0 J	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	**2.2**	NA
	4/13			<10	**0.098 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	**0.91 J**	<1,000
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	**0.82 J**	<1,000
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**1.2**	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**0.85 J**	<500
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**1.1**	<500
MW-33	3/09	344.1	356.1	<10	**3.2**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**2.4**	<500
	9/09			<10	**2.6**	<1.0	<1.0	**0.20 J**	<1.0	<3.0	<5.0	<1.0	<500
	4/10			<10	**1.6**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**2.0**	<500
	10/10			<10	**1.7**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	**2.7**	NA
	4/11			<10	**0.79 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	**1.9**	NA
	10/11			<10	**0.58 J**	<1.0	<1.0	**0.12 J**	<1.0	<3.0	<5.3	**1.9**	NA
	4/12			<2.7	**0.11 J**	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	**1.3**	NA
	10/12			<10	**0.33 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	**2.1**	NA
	4/13			<10	**1.1**	<1.0	<1.0	<1.0	<1.0	<3.0	<4.8 J	**2.1 J**	NA
	7/13			<10	**0.46 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	**0.96 J**	<1,000
	10/13			<10	**1.1**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**0.69 J**	NA
	1/14			<10 J	**0.69 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**1.7**	NA
	4/14			<10	**1.1**	<1.0	<1.0	<1.0	<1.0	<3.0	**0.32 J**	**2.3**	NA
MW-34	3/09	362.7	354.7	**14**	**1.4**	<1.0	<1.0	**0.7 J**	<1.0	**1.5 J**	**12**	**2.0**	<500
	9/09			**24**	<1.0	<1.0	<1.0	**0.64 J**	<1.0	**1.7 J**	<5.0	**2.5**	**1,000**
	4/10			**50 J**	**0.82 J**	<1.0	<1.0	**0.42 J**	<1.0	**1.4 J**	<5.0	**2.4**	<500
	10/10			**20**	**1.0**	<1.0	<1.0	**0.44 J**	<1.0	**1.3 J**	**1.8 J**	**2.9**	<500 J
	4/11			**16**	**1.7**	<1.0	<1.0	**0.74 J**	<1.0	**2.0 J**	**10**	**2.7**	<500
	10/11			**350**	**1.2**	<1.0	<1.0	**0.71 J**	<1.0	**0.90 J**	<5.6	**2.5**	<500
	4/12			**37 J**	**1.3**	<0.10	<0.18	**0.59 J**	<0.090	**1.4 J**	**2.1 J**	**2.4**	<500
	10/12			**61**	**1.6**	<1.0	<1.0	**0.78 J**	<1.0	**2.2 J**	<5.2	**2.7**	NA
	4/13			**26 J**	**1.3**	<1.0	<1.0	**0.60 J**	<1.0	**2.3 J**	<4.8	**1.7**	<1,000
	7/13			**32**	**1.3**	<1.0	<1.0	**0.66 J**	<1.0	**2.0 J**	**0.56 J**	**0.92 J**	NA
	10/13			**15**	**1.2**	<1	<1.0	**0.69 J**	**0.13 J**	**2.2 J**	<5.0	**1.3**	<500
	1/14			**15 J**	**0.91 J**	<1.0	<1.0	**0.44 J**	<1.0	**1.3 J**	<10	**1.9**	<500
	4/14			**57**	**1.4**	**0.11 J**	<1.0	**0.62 J**	<1.0	**3.6**	**2.6 J**	**1.6**	<500

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Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
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Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
MW-35	3/09	363	355	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	9/09			**6.5 J**	<1.0	<1.0	<1.0	**0.16 J**	<1.0	<3.0	<5.0	<1.0	**1,100**
	4/10			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	<500 J
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.6	<1.1	<500
	10/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	<500
	4/12			**14 J**	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	<500
	10/12			<36 B	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<1.0	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.1	<1.0	**470 J**
	7/13			**4.2 J**	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0 J	<1.0	<1,000
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2 J	<1.0	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	<500
	4/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**1.6**	<500
MW-36[E]	3/09	363.6	355.6	**28**	**2.4**	<1.0	<1.0	**0.8 J**	<1.0	**2.8 J**	**150**	**2.8**	<500
(Replaced by MW-36R)	6/09			NA	NA	NA	NA	NA	NA	NA	**460**	<5.0	NA
	9/09			**21**	**3.1**	<1.0	<1.0	**0.96 J**	<1.0	**3.2**	**390**	**3.1**	<500
	4/10			<10 J	**3.3**	**0.26 J**	<1.0	**1.1**	<1.0	**5.4**	**77**	**2.6**	<500
	10/10			**12**	**3.9**	**0.28 J**	<1.0	**1.2**	<1.0	**4.8**	**620**	<5.0	<500 J
	4/11			<10	**4.3**	<1.0	<1.0	**0.95 J**	<1.0	**4.4**	**310**	**4.0**	NA
	10/11			<10	**1.8**	<1.0	<1.0	**0.66 J**	<1.0	**1.4 J**	**92**	**3.6**	NA
	12/11			NA	NA	NA	NA	NA	NA	NA	**120**	NA	NA
	4/12			**6.3 J**	**1.6**	**0.16 J**	<0.18	**0.45 J**	<0.090	**1.9 J**	**150**	**4.1**	NA
	10/12			<10	**1.5 J**	<1.0	<1.0	**0.54 J**	<1.0	**2.2 J**	**10**	**3.1**	NA
	4/13			<10	**1.8**	**0.14 J**	<1.0	**0.53 J**	<1.0	**2.9 J**	**150**	**4.0**	NA
	7/13			<10	**1.4**	**0.11 J**	<1.0	**0.46 J**	<1.0	**1.7 J**	**97**	**2.0**	<1,000
	10/13			<10	**1.3**	<1.0	<1.0	**0.45 J**	<1.0	**1.7 J**	**110**	**1.9**	NA
	1/14			<10 J	**1.2**	<1.0	<1.0	**0.42 J**	<1.0	**1.4 J**	**180**	**4.1**	NA
	4/14			**5.5 J**	**1.1**	**0.12 J**	<1.0	**0.42 J**	<1.0	**1.6 J**	**140**	**3.4**	NA
TW-01	3/09	365.1	355.4	<10	**1.9**	<1.0	<1.0	<1.0	<1.0	**0.6 J**	<5.0	<0.5	**22,300**
	9/09			**2.9 J**	<1.0	<1.0	<1.0	**0.11 J**	<1.0	<3.0	<5.0	**1.1**	**970**
	4/10			<10	**0.32 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**1.0**	<500
	10/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	**1.3**	<500 J
	4/11			<10	**0.21 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	<500
	10/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0 J	<5.6	**1.6**	<500
	4/12			<2.7	**0.11 J**	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	**1.7**	<500
	10/12			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	**1.9**	NA
	4/13			<10	**0.090 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	**0.98 J**	<1,000
	7/13			<10	**0.11 J**	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	**1.0**	<1,000
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	**1.1**	<500
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**0.98 J**	<500
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	**1.3**	<500

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Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
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Monitoring Well	Sampling Date	Screen Elev. (feet AMSL) Top	Bottom	Acetone	Benzene	Ethylbenzene	Methylene Chloride	Toluene	Trichloroethene	Xylene[A]	Aniline	N,N-Dimethyl-aniline	Methanol
NYSDEC Groundwater Quality Standards (TOGS 1.1.1)				50	1	5	5	5	5	5	5	1	NS
TW-02RR[BE] (Replaced by TW-02RRR)	3/09	363.3	353.3	<10 [<10]	**5.0 [4.6]**	**1.5 [1.6]**	<1.0 [<1.0]	**1.0 [1.0 J]**	<1.0 [<1.0]	**4.2 [4.1]**	**2,000 [1,600]**	<10 [<10]	<500 [<500]
	6/09			NA	NA	NA	NA	NA	NA	NA	**2,800**	<20	NA
	9/09			<10 [<10]	**4.3 [4.2]**	**1.2 [1.3]**	<1.0 [<1.0]	**0.79 J [0.81 J]**	<1.0 [<1.0]	**3.5 [3.6]**	**1,600 [1,500]**	<10 [<10]	**1,000 [1,200]**
	4/10			**9.5 J [12 J]**	**4.1 [4.0]**	**1.2 [1.2]**	<1.0 [<1.0]	**0.78 J [0.75 J]**	<1.0 [<1.0]	**4.2 [4.0]**	**2,800 J [3,100 J]**	<20 J [<20 J]	<500 [<500]
	10/10			<10 [<10]	**3.3 [3.0]**	**1.0 [0.91 J]**	<1.0 [<1.0]	**0.82 J [0.76 J]**	<1.0 [<1.0]	**3.6 [3.6]**	**760 [810]**	**<5.0 [2.2 J]**	<500 J [<500 J]
	4/11			<10 [<10]	**2.1 [2.0]**	**1.2 [1.3]**	<1.0 [<1.0]	**0.74 J [0.75 J]**	<1.0 [<1.0]	**5.2 [5.3]**	**1.9 J [2.1 J]**	**3.4 [3.3]**	<500 [<500]
	10/11			<10 [<10]	**1.2 [1.1]**	**0.67 J [0.69 J]**	<1.0 [<1.0]	**0.53 J [0.48 J]**	<1.0 [<1.0]	**1.5 J [1.4 J]**	**1,300 D [1,500 D]**	**5.5 [6.2]**	<500 [<500]
	12/11			NA	NA	NA	NA	NA	NA	NA	**1,400**	NA	NA
	4/12			**15 J [13 J]**	**1.6 [1.5]**	**0.73 J [0.76 J]**	<0.18 [<0.18]	**0.51 J [0.48 J]**	<0.090 [<0.090]	**1.6 J [1.6 J]**	**1,400 J [1,600 J]**	<2.2 J [<2.2 J]	<500 [<500]
	10/12			<10 [<10]	**1.1 J [0.98 J]**	**0.29 J [0.27 J]**	<1.0 [<1.0]	**0.26 J [0.27 J]**	<1.0 [<1.0]	**0.91 J [0.89 J]**	<5.2 **[3.2 J]**	**2.2 [1.9]**	NA
	4/13			<10 [<10]	**1.4 [1.3]**	**0.60 J [0.64 J]**	<1.0 [<1.0]	**0.36 J [0.38 J]**	<1.0 [<1.0]	**1.5 J [1.5 J]**	**620 [700]**	**3.5 J [3.4 J]**	<1,000 [<1,000]
	7/13			<10 [<10]	**0.91 J [0.91 J]**	**0.25 J [0.26 J]**	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 J [**14 J**]	**0.72 J [0.70 J]**	**150 [170]**	**1.7 [1.8]**	<1,000 [<1,000]
	10/13			<10 [<10]	**0.60 J [0.60 J]**	<1.0 **[0.15 J]**	<1.0 [<1.0]	**0.20 J [0.17 J]**	**0.15 J [0.11 J]**	<3.0 [<3.0]	**90 [72]**	**2.1 [1.4]**	<500 [<500]
	1/14			<10 J [<10 J]	**1.1 [1.1]**	**0.27 J [0.33 J]**	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	0.69 J [0.77 J]	**660 [750 D]**	**1.8 J [3.7]**	<500 [<500]
	4/14			**8.0 J [10]**	**1.2 [1.2]**	**0.51 J [0.44 J]**	<1.0 [<1.0]	**0.18 J [0.17 J]**	<1.0 [<1.0]	**1.0 J [0.96 J]**	**1,300 J [1,700 J]**	**2.8 J [3.5 J]**	<500 [<500]
PZ-4D	3/09	350.8	345.9	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	4/10			<10	<1.0	<1.0	**5.3 J**	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	6/10			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	NA	NA	NA
	4/11			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	NA
	4/12			<2.7	<0.080	<0.10	<0.18	**0.23 J**	<0.090	<0.36	<1.8	<0.21	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<4.8	<0.95	NA
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	NA
	10/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA
	4/14			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA
PZ-4S	3/09	362.79	357.88	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.0	<0.5	<500
	4/10			<10	<1.0	<1.0	**17**	<1.0	<1.0	<3.0	<5.0	<1.0	<500
	6/10			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	NA	NA	NA
	4/11			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.3	<1.1	NA
	4/12			<2.7	<0.080	<0.10	<0.18	<0.15	<0.090	<0.36	<1.8	<0.21	NA
	4/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<5.2	<1.0	NA
	7/13			<10	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<1.0	<1.0	NA
	1/14			<10 J	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0	<10	<1.0	NA

See Notes on Page 8.

Table 3. Summary of Groundwater Monitoring Data, March 2009 through April 2014
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

General Notes:

1. Concentrations are presented in micrograms per liter, which is equivalent to parts per billion.
2. Compounds detected are indicated by bold-faced type.
3. Detections exceeding NYSDEC Groundwater Standards (TOGS 1.1.1; NYSDEC 1998) are indicated by shading.
4. Duplicate sample results are presented in brackets (e.g., [14]).
5. The sampling event in June 2010 was an interim sampling event to check for the presence of methylene chloride.
6. Results from the July 2013, October 2013, January 2014, and April 2014 sampling events reflect groundwater quality conditions after the shutdown of the *in-situ* bioremediation treatment and closed loop hydraulic systems.

Superscript Notes:

[A]= Data presented is total xylenes (m- and p-xylenes and o-xylenes).
[B] = Wells MW-8S and TW-02R were abandoned in August 2004 and replacement wells MW-8SR and TW-02RR were installed in August 2004.
[C] = Well MW-9 was abandoned during OU1 soil remediation activities (1994).
[D] = Well/piezometer MW-17 was abandoned November 1997 through January 1998.
[E] = Wells/piezometers MW-36, PZ-5S, PZ-W, and TW-02RR were abandoned in November 2010. Replacement wells TW-02RRR (replaced TW-02RR) and MW-36R (replaced MW-36 and PZ-W) were installed in November 2010.

Abbreviations:

AMSL = above mean sea level (National Geodetic Vertical Datum of 1929)
NA = compound was not analyzed for in the sample
NS = standard not available
NYSDEC = New York State Department of Environmental Conservation
TOGS = Technical and Operational Guidance Series

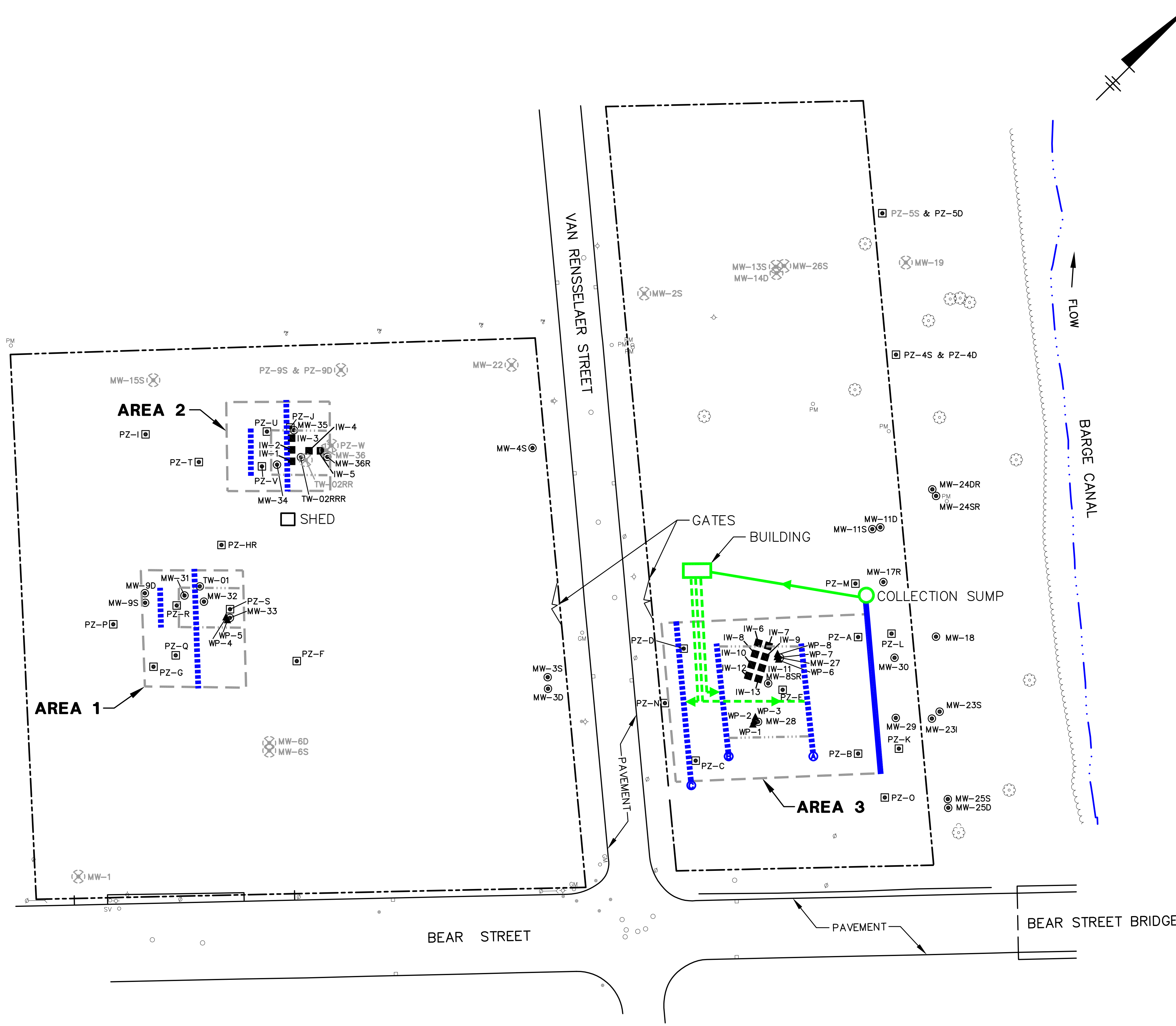
Analytical Qualifiers:

B = The compound was found in associated method blank.
D = Concentration is based on a diluted sample analysis.
J = The compound was positively identified; however, the numerical value is an estimated concentration only.
< = Compound was not detected at the listed quantitation limit.

NYSDEC. 1998. NYSDEC. 1998. Technical Operational Guidance Series 1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June.
Available online at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

ARCADIS

Figures



LEGEND:

UTILITY POLE
CATCH BASIN
PETROLEUM PIPE LINE MARKER
GAS LINE MARKER
SEWER VENT
HYDRANT
WATER VALVE
MANHOLE
PROPERTY LINE
MW-19 GROUNDWATER MONITORING WELL
PZ-A PIEZOMETER
PZ-W REMOVED/DECOMMISSIONED WELL/PIEZOMETER
WP-8 WELL POINT
IW-3 OXYGEN INFUSION WELL
APPROXIMATE BOUNDARY OF OPERABLE UNIT 2 TREATMENT AREA
AREA OF HISTORICALLY RELATIVELY HIGHER CONCENTRATIONS OF CONSTITUENTS OF CONCERN
GROUNDWATER WITHDRAWAL TRENCH
GROUNDWATER INFILTRATION TRENCH
AREA 3 GROUNDWATER INFILTRATION TRENCH IDENTIFICATION
PIPING TO BUILDING
PIPING FROM BUILDING
TREE LINE
EDGE OF BARGE CANAL

NOTES:

1. REPLACED MONITORING WELLS ARE IDENTIFIED WITH AN "R" (e.g., MW-24DR).
2. LOCATIONS ARE APPROXIMATE.
3. STANDPIPES ARE LOCATED IN AREAS 1 AND 2, SCREENED WITHIN THE INFILTRATION TRENCHES. ADDITIONAL STANDPIPES ARE LOCATED IN AREA 2 OUTSIDE OF THE INFILTRATION TRENCHES. STANDPIPE LOCATIONS ARE NOT SHOWN ON THE FIGURE.
4. DURING HYDRAULIC MONITORING EVENTS, BARGE CANAL SURFACE WATER LEVELS ARE MEASURED FROM A DEMARCATED REFERENCE POINT AT THE CENTER OF THE BEAR STREET BRIDGE (LOCATION NOT SHOWN ON THIS FIGURE).

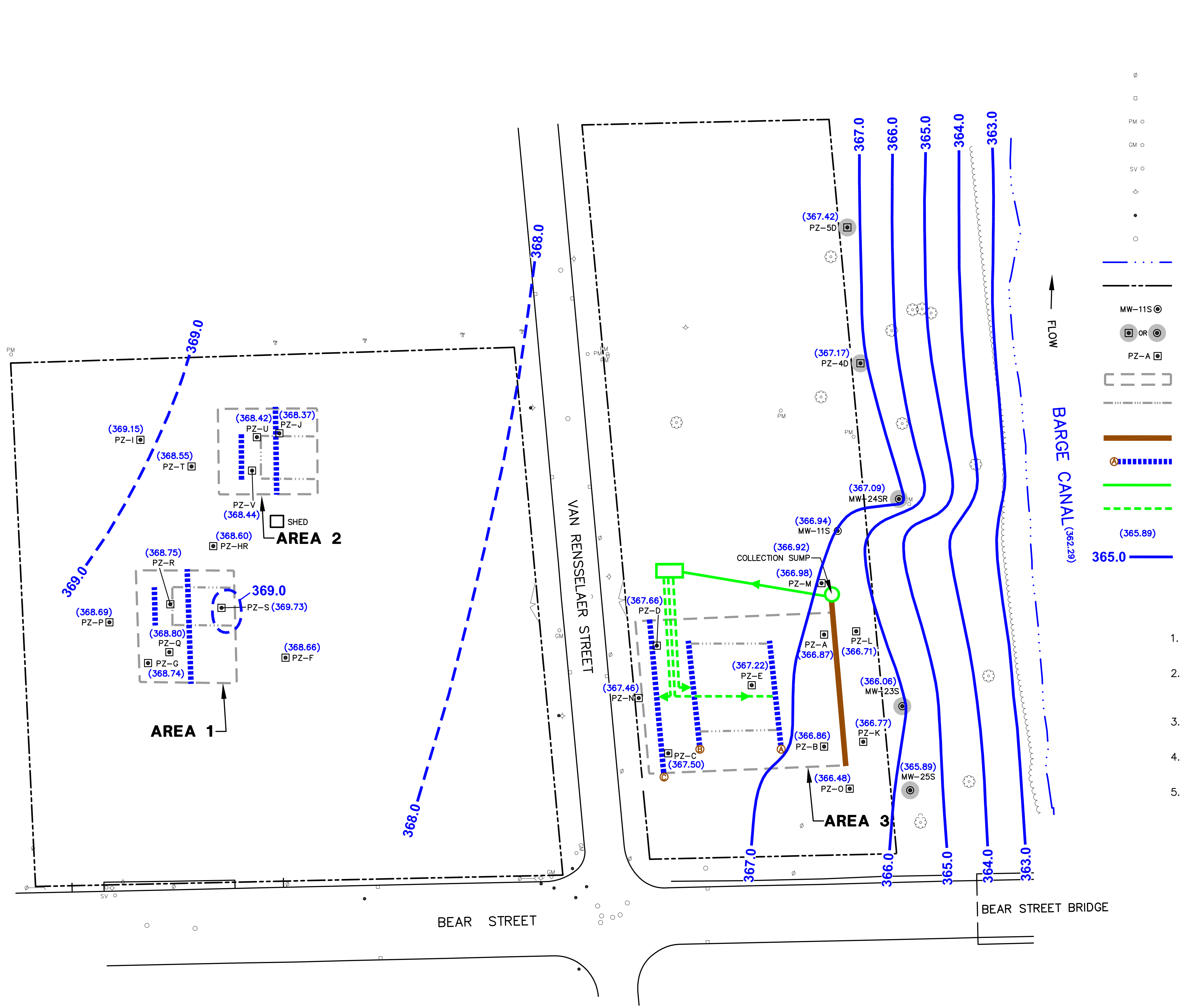
0 100' 200'
GRAPHIC SCALE

McKESSON ENVIROSYSTEMS SITE
SYRACUSE, NEW YORK
MONITORING MEMORANDUM

SITE PLAN

ARCADIS

FIGURE
1



LEGEND:

- UTILITY POLE
- CATCH BASIN
- PM PETROLEUM PIPE LINE MARKER
- GM GAS LINE MARKER
- SV SEWER VENT
- HYDRANT
- WATER VALVE
- MANHOLE
- EDGE OF BARGE CANAL
- PROPERTY LINE
- MW-11S GROUNDWATER MONITORING WELL
- OR DOWNGRADIENT PERIMETER GROUNDWATER MONITORING LOCATION
- PZ-A PIEZOMETER
- APPROXIMATE BOUNDARY OF AREA
- AREA OF HISTORICALLY RELATIVELY HIGHER CONCENTRATIONS OF CONSTITUENTS OF CONCERN
- GROUNDWATER WITHDRAWAL TRENCH
- A GROUNDWATER INFILTRATION TRENCH AND IDENTIFICATION
- PIPING TO BUILDING
- PIPING FROM BUILDING
- (365.89) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (AMSL)
- 365.0 GROUNDWATER ELEVATION CONTOUR (FEET AMSL) DASHED WHERE INFERRED

NOTES:

1. ONLY THE HYDRAULIC MONITORING LOCATIONS USED TO DRAW THIS MAP ARE SHOWN.
2. REPLACED MONITORING WELLS AND PIEZOMETERS ARE IDENTIFIED WITH AN "R" (e.g., MW-24DR).
3. ELEVATIONS REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
4. THE BARGE CANAL ELEVATION WAS MEASURED FROM A MARKED POINT ON THE BEAR STREET BRIDGE.
5. CONTOUR INTERVAL = 1.0 FOOT.

0 100' 200'

GRAPHIC SCALE

McKESSON ENVIROSYSTEMS SITE
SYRACUSE, NEW YORK
MONITORING MEMORANDUM

POTENTIOMETRIC SURFACE OF THE SHALLOW HYDROGEOLOGIC UNIT SAND LAYER APRIL 14, 2014

ARCADIS

FIGURE
2

TW-02RRR												
Date	4/30/2010	10/14/2010	4/5/2011	10/27/2011	12/15/2011	4/12/2012	10/5/2012	4/8/2013	7/25/2013	10/24/13	1/24/2014	4/17/2014
Acetone	9.5 J [12 J]	<10 [<10]	<10 [<10]	<10 [<10]	NA	15 J [13 J]	<10 [<10]	<10 [<10]	<10 [<10]	<10 [<10]	<10 J [<10 J]	8.0 J [10]
Benzene	4.1 [4.0]	3.3 [3.0]	2.1 [2.0]	1.2 [1.1]	NA	1.6 [1.5]	1.1 J [0.98 J]	1.4 [1.3]	0.91 J [0.91 J]	0.60 J [0.60 J]	1.1 [1.1]	1.2 [1.2]
Ethylbenzene	1.2 [1.2]	1.0 [0.91 J]	1.2 [1.3]	0.67 J [0.69 J]	NA	0.73 J [0.76 J]	0.29 J [0.27 J]	0.60 J [0.64 J]	0.25 J [0.26 J]	<1.0 [0.15 J]	0.27 J [0.33 J]	0.51 J [0.44 J]
Methylene Chloride	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	NA	<0.18 [<0.18]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]
Toluene	0.78 J [0.75 J]	0.82 J [0.76 J]	0.74 J [0.75 J]	0.53 J [0.48 J]	NA	0.51 J [0.48 J]	0.26 J [0.27 J]	0.36 J [0.38 J]	<1.0 [<1.0]	0.20 J [0.17 J]	<1.0 [<1.0]	0.18 J [0.17 J]
Trichloroethene	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	NA	<0.090 [<0.090]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 J [14 J]	0.15 J [0.11 J]	<1.0 [<1.0]	<1.0 [<1.0]
Xylenes (total)	4.2 [4.0]	3.6 [3.6]	5.2 [5.3]	1.5 J [1.4 J]	NA	1.6 J [1.6 J]	0.91 J [0.89 J]	1.5 J [1.5 J]	0.72 J [0.70 J]	<3.0 [<3.0]	0.69 J [0.77 J]	1.0 J [0.96 J]
Aniline	2800 J [3100 J]	760 [810]	1.9 J [2.1 J]	1300 D [1500 D]	1400	1400 J [1600 J]	<5.2 [3.2 J]	620 [700]	150 [170]	90 [72]	660 [750 D]	1300 J [1700 J]
N,N-Dimethylaniline	<20 J [<20 J]	<5.0 [2.2 J]	3.4 [3.3]	5.5 [6.2]	NA	<2.2 J [<2.2 J]	2.2 [1.9]	3.5 J [3.4 J]	1.7 [1.8]	2.1 [1.4]	1.8 J [3.7]	2.8 J [3.5 J]
Methanol	<500 [<500]	<500 J [<500 J]	<500 [<500]	<500 [<500]	NA	<500 [<500]	NA	<1000 [<1000]	<1000 [<1000]	<500 [<500]	<500 [<500]	<500 [<500]

MW-35											
Date	4/30/2010	10/14/2010	4/5/2011	10/26/2011	4/11/2012	10/4/2012	4/4/2013	7/24/2013	10/23/13	1/23/2014	4/16/2014
Acetone	<10 J	<10	<10	<10	14 J	<36 B	<10	4.2 J	<10	<10 J	<10 J
Benzene	<1.0	<1.0	<1.0	<1.0	<0.080	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.0	<5.6	<5.1	<1.8	<5.0	<5.1	<1.0 J	<5.2 J	<10	<10
N,N-Dimethylaniline	<1.0	<1.0	<1.1	<1.0	<0.21	<1.0	<1.0	<1.0	<1.0	<1.0	1.6
Methanol	<500	<500 J	<500	<500	<500	NA	470 J	<1000	<500	<500	<500

MW-34											
Date	4/30/2010	10/14/2010	4/5/2011	10/26/2011	4/12/2012	10/4/2012	4/8/2013	7/26/2013	10/24/13	1/24/2014	4/17/2014
Acetone	50 J	20	16	350	37 J	61	26 J	32	15	15 J	57
Benzene	0.82 J	1	1.7	1.2	1.3	1.6	1.3	1.3	1.2	0.91 J	1.4
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	0.11 J
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	0.42 J	0.44 J	0.74 J	0.71 J	0.59 J	0.78 J	0.60 J	0.66 J	0.69 J	0.44 J	0.62 J
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	0.13 J	<1.0	<1.0
Xylenes (total)	1.4 J	1.3 J	2.0 J	0.90 J	1.4 J	2.2 J	2.3 J	2.0 J	2.2 J	1.3 J	3.6
Aniline	<5.0	1.8 J	10	<5.6	2.1 J	<5.2	<4.8	0.56 J	<5.0	<10	2.6 J
N,N-Dimethylaniline	2.4	2.9	2.7	2.5	2.4	2.7	1.7	0.92 J	1.3	1.9	1.6
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	NA	<500	<500	<500

MW-36R												
Date	4/30/2010	10/14/2010	4/5/2011	10/26/2011	12/15/2011	4/12/2012	10/5/2012	4/8/2013	7/26/2013	10/24/13	1/24/14	4/17/2014
Acetone	<10 J	12	<10	<10	NA	6.3 J	<10	<10	<10	<10	<10 J	5.5 J
Benzene	3.3	3.9	4.3	1.8	NA	1.6	1.5 J	1.8	1.4	1.3	1.2	1.1
Ethylbenzene	0.26 J	0.28 J	<1.0	<1.0	NA	0.16 J	<1.0	0.14 J	0.11 J	<1.0	<1.0	0.12 J
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	NA	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	1.1	1.2	0.95 J	0.66 J	NA	0.45 J	0.54 J	0.53 J	0.46 J	0.45 J	0.42 J	0.42 J
Trichloroethene	<1.0	<1.0	<1.0	<1.0	NA	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	5.4	4.8	4.4	1.4 J	NA	1.9 J	2.2 J	2.9 J	1.7 J	1.7 J	1.4 J	1.6 J
Aniline	77	620	310	92	120	150	10	150	97	110	180	140
N,N-Dimethylaniline	2.6	<5.0	4.0	3.6	NA	4.1	3.1	4.0	2.0	1.9	4.1	3.4
Methanol	<500	<500 J	NA	NA	NA	NA	NA	NA	<1000	NA	NA	NA

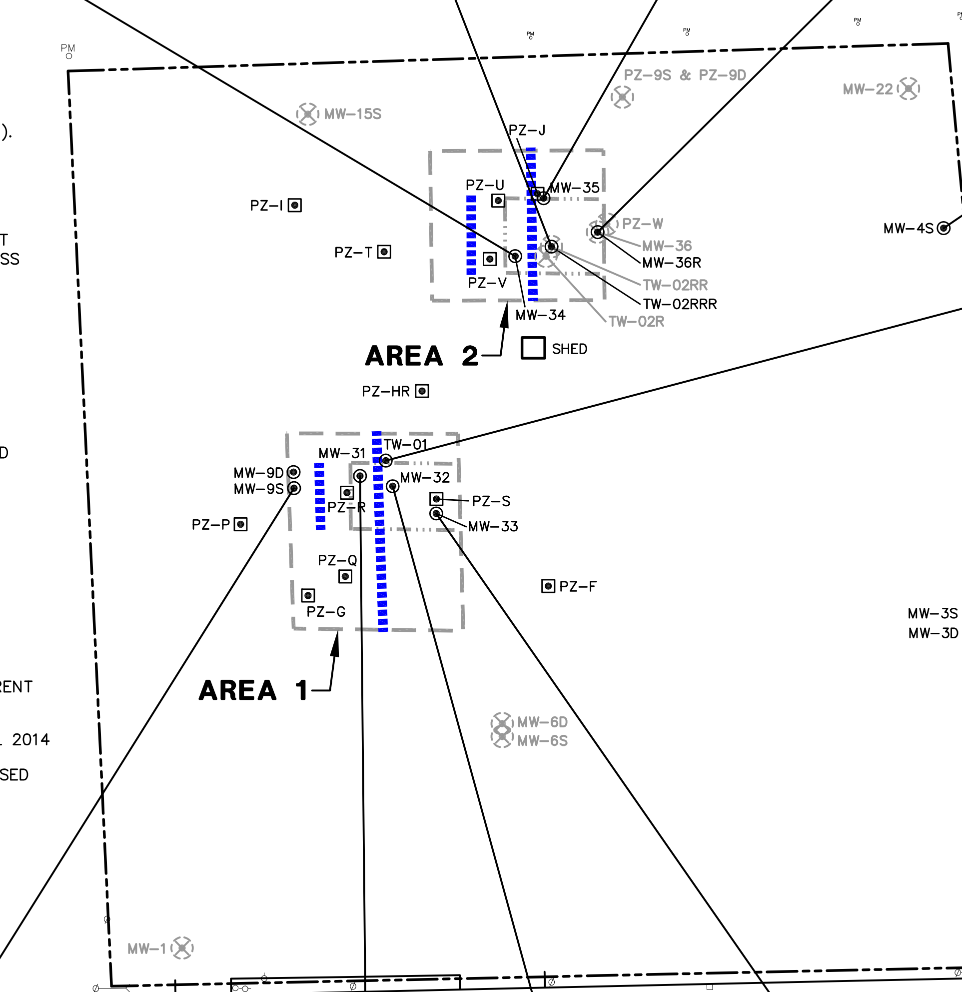
MW-4S				
Date	10/15/2010	4/11/2012	7/24/2013	4/16/2014
Acetone	<10 [<10]	<2.7	<10	<10
Benzene	<1.0 [<1.0]	<0.080	<1.0	<1.0
Ethylbenzene	<1.0 [<1.0]	<0.10	<1.0	<1.0
Methylene Chloride	<1.0 [<1.0]	<0.18	<1.0	<1.0
Toluene	<1.0 [<1.0]	<0.15	<1.0	<1.0
Trichloroethene	<1.0 [<1.0]	<0.090	<1.0	<1.0
Xylenes (total)	<3.0 [<3.0]	<0.36	<3.0	<3.0
Aniline	<5.0 [<5.0]	<1.8	<1.0	<10
N,N-Dimethylaniline	<1.0 [<1.0]	<0.21	<1.0	<1.0
Methanol	<500 J [<500 J]	NA	NA	NA

TW-01											
Date	4/28/2010	10/12/2010	4/4/2011	10/25/2011	4/11/2012	10/4/2012	4/4/2013	7/25/2013	10/23/13	1/23/14	4/17/2014
Acetone	<10	<10	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	0.32 J	<1.0	0.21 J	<1.0	0.11 J	<1.0	0.090 J	0.11 J	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0 J	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.3	<5.3	<5.6	<1.8	<5.2	<5.2	<1.0	<5.0	<10	<10
N,N-Dimethylaniline	1	1.3	<1.1	1.6	1.7	1.9	0.98 J	1.0	1.1	0.98 J	1.3
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	<500

MW-3S											
Date	4/28/2010	10/12/2010	4/6/2011	10/27/2011	4/11/2012	10/4/2012	4/4/2013	7/24/2013	10/23/13	1/22/14	4/15/2014
Acetone	<10	<10	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	<1.0	<1.0	<1.0	<1.0	<0.080	0.27 J	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.35 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.2	<5.3 J	<5.0	<1.8	<5.0	<5.2	<1.0	<5.0	<10	<10
N,N-Dimethylaniline	<1.0	<1.0	<1.1 J	<1.0	<0.21	<0.61 J	<1.0	<1.0	<1.0	<1.0	<1.0
Methanol	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:

1. REPLACED MONITORING WELLS ARE IDENTIFIED WITH AN "R" (e.g., MW-24DR).
2. TRENCH LOCATIONS ARE APPROXIMATE.
3. MONITORING LOCATIONS ARE APPROXIMATE.
4. FIGURE ONLY SHOWS CONSTITUENT OF CONCERN (COC) CONCENTRATIONS AT MONITORING LOCATIONS WITHIN THE IMPACTED AREAS AND THE COC PROCESS CONTROL MONITORING LOCATIONS.
5. ONLY COCs WITH CURRENT OR PAST DETECTIONS ARE PRESENTED ON THIS FIGURE.
6. < = COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. THE ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
7. NA = COMPOUND WAS NOT ANALYZED FOR IN THE SAMPLE.
8. J = THE COMPOUND WAS POSITIVELY IDENTIFIED; HOWEVER THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.
9. D = CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS.
10. B = COMPOUND FOUND IN ASSOCIATED METHOD BLANK.
11. SAMPLE DATA ARE COMPARED TO NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GROUNDWATER QUALITY STANDARDS (GQS) (TECHNICAL AND OPERATIONAL GUIDANCE SERIES 1.1.1).
12. NS = GQS NOT AVAILABLE.
13. RESULTS FOR DUPLICATE SAMPLES ARE SHOWN IN BRACKETS NEXT TO PARENT SAMPLE RESULTS.
14. RESULTS FROM THE JULY 2013, OCTOBER 2013, JANUARY 2014, AND APRIL 2014 SAMPLING EVENTS REFLECT GROUNDWATER QUALITY CONDITIONS AFTER THE SHUTDOWN OF THE IN-SITU AEROBIC BIOREMEDIATION TREATMENT AND CLOSED LOOP HYDRAULIC SYSTEMS.



MW-9S											
Date	4/28/2010	10/13/2010	4/5/2011	10/25/2011	4/12/2012	10/5/2012	4/8/2013	7/26/2013	10/25/2013	1/24/14	4/18/2014
Acetone	<10	<10	<10	<10	7.5 J	<10	12 J	<10	<5.0	<10 J	<10
Benzene	0.86 J	1.3	0.91 J	1.2	1.1	1.9 J	0.95 J	1.9	2.9	1.1	1.0
Ethylbenzene	26	11	29	4.2	18	4.7	19	12	10	13	19
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	2.1	1.9	2.6	1.8	1.5	3.2	1.6	2.0	2.6	1.6	2.2
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	69	45	89	41 J	67	84	62	45	60	54	74
Aniline	<5.0	<5.1	<5.3	<5.0	<1.9	<5.0	<5.1	<1.0	<5.0	<10	<10
N,N-Dimethylaniline	6.5	7.5	5.4	7.6	6.3	3.9	5.9	2.0	5.2	7.2	5.7
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	<500

MW-33											
Date	4/28/2010	10/12/2010	4/5/2011	10/26/2011	4/11/2012	10/5/2012	4/4/2013	7/24/2013	10/23/13	1/23/14	4/17/2014
Acetone	<10	<10	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	1.6	1.7	0.79 J	0.58 J	0.11 J	0.33 J	1.1	0.46 J	1.1	0.69 J	1.1
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.12 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.1	<5.3	<5.3	<1.8	<5.1	<4.8 J	<1.0	<5.0	<10	0.32 J
N,N-Dimethylaniline	2.0	2.7	1.9	1.9	1.3	2.1 J	2.1 J	0.96 J	0.69 J	1.7	2.3
Methanol	<500	NA	NA	NA	NA	NA	NA	<1000	NA	NA	NA

MW-31											
Date	4/28/2010	10/13/2010	4/5/2011	10/25/2011	4/12/2012	10/5/2012	4/5/2013	7/25/2013	10/24/13	1/24/14	4/17/2014
Acetone	<10	<10	<10	<10	6.5 J	<10	<10	<10	<10	<10 J	<10
Benzene	4.8	6.9	8.3	5.7	6.8	6.3 J	12	11	11	8.2	7.5
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	0.16 J	0.16 J	0.21 J	<1.0	0.15 J	<1.0	0.22 J
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	0.40 J	0.50 J	0.77 J	0.62 J	0.65 J	0.44 J	1.3	1.2	1.4	1.2	0.93 J
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	1.3 J	1.5 J	2.5 J	1.5 J	2.7 J	2.3 J	5.6	5.1	6.1	6.3	4.6
Aniline	<5.0	<5.3	<5.3	<5.0	<1.9	<5.0	<5.2	0.72 J	<5.2	<10	0.75 J
N,N-Dimethylaniline	2.3	3.5	2.3	3.5	2.1	0.90 J	1.1	1.6	2.2	2.2	1.9
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	<1000	<500	NA	<500

MW-32											
Date	4/28/2010	10/12/2010	4/4/2011	10/25/2011	4/11/2012	10/5/2012	4/5/2013	7/25/2013	10/23/13	1/23/14	4/17/2014
Acetone	<10	<10	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	0.23 J	<1.0	<1.0	<1.0	<0.080	<1.0 J	0.098 J	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.19 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0 J	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.2	<5.3	<5.0	<1.8	<5.1	<5.1	<1.0	<5.0	<10	<10
N,N-Dimethylaniline	0.89 J	0.87 J	<1.1	1.5	1.1	2.2	0.91 J	0.82 J	1.2	0.85 J	1.1
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	<500

LEGEND:

- UTILITY POLE
- CATCH BASIN
- PM PETROLEUM PIPE LINE MARKER
- GM GAS LINE MARKER
- SV SEWER VENT
- HYDRANT
- WATER VALVE
- MANHOLE
- PROPERTY LINE
- TW-02RRR GROUNDWATER MONITORING WELL
- PZ-A PIEZOMETER
- TW-02R REMOVED/DECOMMISSIONED GROUNDWATER MONITORING WELL/PIEZOMETER
- APPROXIMATE BOUNDARY OF AREA
- GROUNDWATER INFILTRATION TRENCH
- AREA OF HISTORICALLY RELATIVELY HIGHER CONCENTRATION OF COCs

SAMPLE IDENTIFICATION

DETECTIONS EXCEEDING NYSDEC GQS ARE INDICATED BY SHADING.

MW-##			
Date	Sep-06	Nov-06	Jun-07
Acetone	NA	130 J	33
Benzene	NA	3.6	4.6
Ethylbenzene	NA	<4.0	0.80 J
Methylene Chloride	NA	<3.0	<3.0
Toluene	NA	1.2 J	1.4 J
Trichloroethene	NA	<1.0	<1.0
Xylenes (total)	NA	1.1 J	5
Aniline	3.5	420	1300
N,N-Dimethylaniline	1.2	1.7 J	<10
Methanol	NA	<500	<500

CONCENTRATION (ppb)

NYSDEC GQS (ppb)	
Acetone	50
Benzene	1
Ethylbenzene	5
Methylene Chloride	5
Toluene	5
Trichloroethene	5
Xylenes (total)	5
Aniline	5
N,N-dimethylaniline	1
Methanol	NS

0 100' 200'

GRAPHIC SCALE

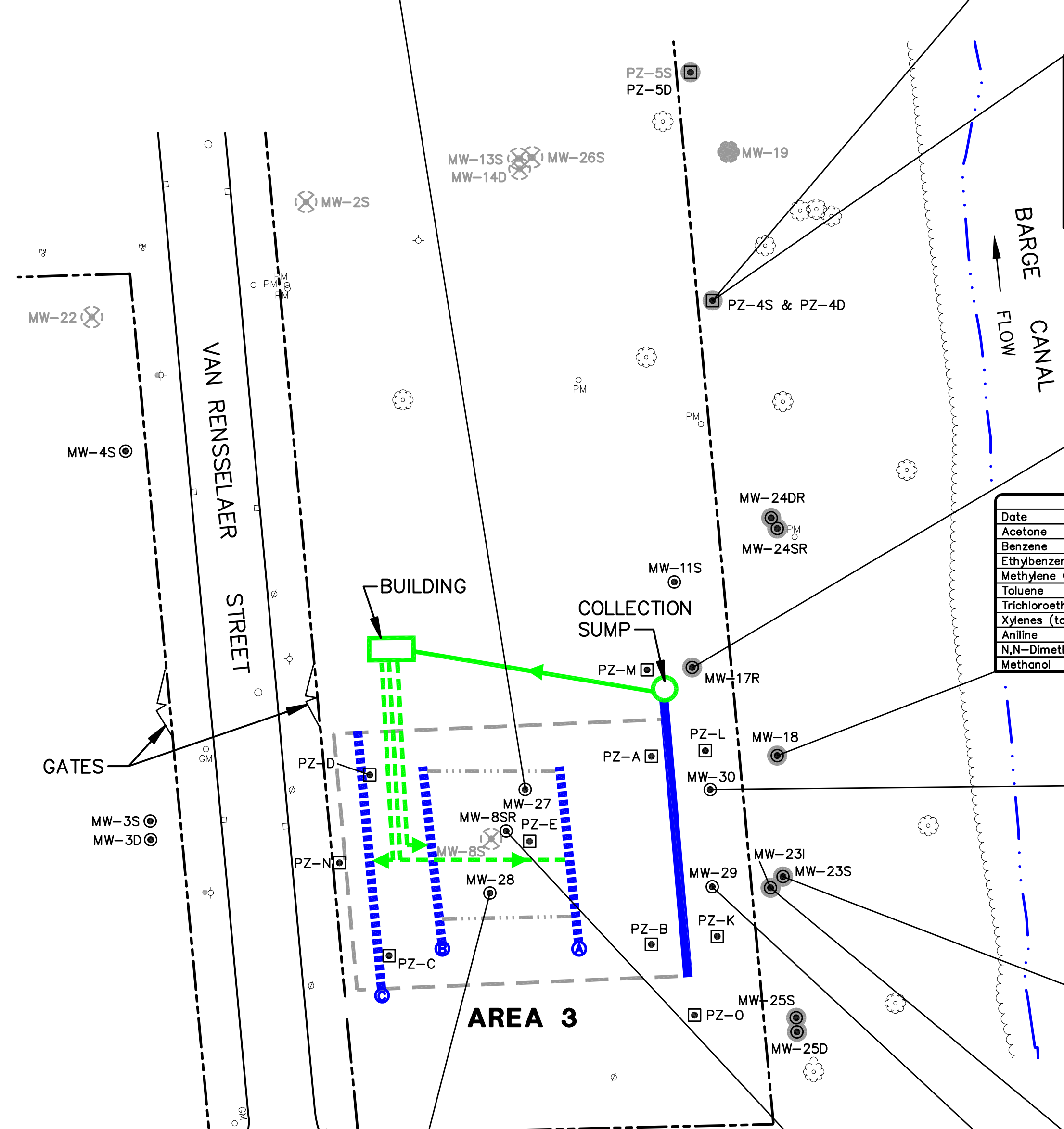
McKESSON ENVIROSYSTEMS SITE
SYRACUSE, NEW YORK
MONITORING MEMORANDUM

GROUNDWATER MONITORING DATA SUMMARY FOR APRIL 2010 - APRIL 2014 AREAS 1 & 2

ARCADIS

FIGURE
3

CITY: SYRACUSE, N.Y. DIV/GROUP: ENV/IM/DV DB: N. SMITHGALL, R. BASSETT, R. ALLEN PM/TM: D. PENNIMAN TR: C. SOBOL LYR: ON=*;OFF=*REF
G:\ENVCAD\SYRACUSE\ACT\B0026003\2014\00190\DWG\MONITOR-MEMO\26003C21.DWG LAYOUT: 3 SAVED: 7/17/2014 11:14 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/17/2014 11:14 AM BY: ALLEN, ROYCE
XREFS: 26003X01 26003XBL IMAGES: PROJECTNAME: ----



MW-27											
Date	4/27/2010	10/12/2010	4/7/2011	10/26/2011	4/12/2012	10/4/2012	4/5/2013	7/24/2013	10/23/13	1/23/2014	4/16/2014
Acetone	<10	<10	3.9 J	<10	<2.7 J	<10	<10	<10	<10	<10 J	<10
Benzene	4.5	2.7	3.1	2.1	1.5	1.1	1.1	2.0	2.6	0.89 J	1.0
Ethylbenzene	6.1	1.4	5.1	2.2	1.4	<1.0	0.88 J	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	2.4	1.3	5.7	1.3	0.45 J	0.22 J	0.34 J	0.60 J	0.75 J	0.33 J	0.41 J
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	10	3.4	9.1	3.1	2.2 J	<3.0	1.4 J	<3.0	3.9	0.22 J	0.92 J
Aniline	1300	220	1000	36	<1.9	<5.0	11	1.5	<5.0	<12	0.60 J
N,N-Dimethylaniline	<10	2.5	<11	2.7	2.7	2.2	2.4	1.1	0.73 J	0.75 J	0.48 J
Methanol	<500	NA	NA	NA	NA	NA	NA	<1000	NA	NA	NA

PZ-4S							
Date	4/29/2010	6/22/2010	4/7/2011	4/10/2012	4/2/2013	7/22/2013	1/20/2014
Acetone	<10	<10 [<10]	<10 J	<2.7	<10	<10	<10 J
Benzene	<1.0	<1.0 [<1.0]	<1.0	<0.080	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0 [<1.0]	<1.0	<0.10	<1.0	<1.0	<1.0
Methylene Chloride	17	<1.0 [<1.0]	<1.0	<0.18	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0 [<1.0]	<1.0	<0.15	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0 [<1.0]	<1.0	<0.090	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0 [<3.0]	<3.0	<0.36	<3.0	<3.0	<3.0
Aniline	<5.0	NA	<5.3	<1.8	<5.2	<1.0	<10
N,N-Dimethylaniline	<1.0	NA	<1.1	<0.21	<1.0	<1.0	<1.0
Methanol	<500	NA	NA	NA	NA	NA	NA

PZ-4D									
Date	4/29/2010	6/22/2010	4/7/2011	4/10/2012	4/2/2013	7/22/2013	10/22/13	1/20/2014	4/16/2014
Acetone	<10	<10	<10	<2.7	<10	<10	<10	<10 J	<10
Benzene	<1.0	<1.0	<1.0	<0.080	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	5.3 J	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.23 J	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	NA	<5.3	<1.8	<4.8	<1.0	<5.2	<10	<10
N,N-Dimethylaniline	<1.0	NA	<1.1	<0.21	<0.95	<1.0	<1.0	<1.0	<1.0
Methanol	<500	NA	NA	NA	NA	NA	NA	NA	NA

MW-17R											
Date	4/28/2010	10/13/2010	4/6/2011	10/25/2011	4/10/2012	10/3/2012	4/3/2013	7/23/2013	10/22/13	1/22/2014	4/15/2014
Acetone	<10	<10	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	0.22 J	1.3	<1.0	<1.0	0.22 J	0.55 J	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.19 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0 J	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.6	<5.3 J	<5.0	<1.8	<5.1	<5.1	<1.2	<5.4	<10	<10
N,N-Dimethylaniline	<1.0	<1.1	<1.1 J	<1.0	<0.21	<1.0	<1.0	<1.2	<1.1	<1.0	<1.0
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	2700

MW-18												
Date	4/29/2010	6/22/2010	10/13/2010	4/7/2011	10/25/2011	4/10/2012	10/3/2012	4/3/2013	7/23/2013	10/22/13	1/20/2014	4/15/2014
Acetone	<10	<10	<10	<10 J	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<0.080	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	33	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	0.23 J	0.27 J	<1.0	0.60 J	0.25 J	0.19 J	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0	<3.0 J	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	NA	<5.1	<5.3	<5.0	<1.8	<5.2	<4.8	<1.0	<5.4	<10	<10
N,N-Dimethylaniline	<1.0	NA	<1.0	<1.1	<1.0	<0.21	<1.0	<0.95	<1.0	<1.1	<1.0	<1.0
Methanol	<500	NA	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	<500

MW-30											
Date	4/27/2010	10/13/2010	4/6/2011	10/25/2011	4/10/2012	10/4/2012	4/4/2013	7/24/2013	10/22/13	1/22/2014	4/15/2014
Acetone	<10	<10 J	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	<1.0	0.14 J	<1.0	<1.0	<0.080	0.099 J	<1.0	0.20 J	0.29 J	0.19 J	0.37 J
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	37	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.18 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0 J	<0.36	<3.0	<3.0	<3.0	<3.0	0.14 J	<3.0
Aniline	<5.0	<5.1	<5.3 J	<5.0	<1.8	<5.3	<5.2	<1.0	<5.2	<11	<10
N,N-Dimethylaniline	<1.0	<1.0	<1.1 J	<1.0	<0.21	<1.1	<1.0	0.30 J	0.85 J	<1.1	0.43 J
Methanol	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

MW-23S											
Date	4/29/2010	10/14/2010	4/7/2011	10/26/2011	4/10/2012	10/2/2012	4/3/2013	7/23/2013	10/21/13	1/20/2014	4/14/2014
Acetone	<10	3.7 J	<10 J	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	<1.0	<1.0	<1.0	<1.0	<0.080	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.31 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.0	<5.3	<5.0	<1.8	<5.1	<5.1	<1.0	<5.2	<10	<10
N,N-Dimethylaniline	<1.0	<1.0	<1.1	<1.0	<0.21	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methanol	<500	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	<500

MW-28											
Date	4/27/2010	10/12/2010	4/7/2011	10/26/2011	4/11/2012	10/4/2012	4/5/2013	7/24/2013	10/23/13	1/23/2014	4/16/2014
Acetone	<10	<10	4.3 J	<10	<2.7	<10	<10	<10	<10	<10 J	13
Benzene	2.8	1.8	2.3	1.8	1.4	1.9	1.7	1.7	1.7	1.2	1.7
Ethylbenzene	0.60 J	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0 B	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	0.23 J	<1.0	0.11 J	0.38 J	0.22 J	0.16 J	<1.0	0.22 J	0.49 J	0.22 J	0.29 J
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	0.46 J	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	0.68 J	<3.0	<3.0
Aniline	<5.0	2.4 J	3.9 J	<5.0	<1.8	<5.0	<5.2	<1.0	<5.0	<10	<10
N,N-Dimethylaniline	0.49 J	0.60 J	0.75 J	<1.0	0.48 J	0.62 J	0.32 J	0.35 J	0.70 J	0.75 J	0.72 J
Methanol	<500	<500 J	<500	<500	<500	NA	410 J	<1000	<500	<500	<500

MW-23I												
Date	4/29/2010	6/22/2010	10/14/2010	4/7/2011	10/26/2011	4/10/2012	10/2/2012	4/3/2013	7/23/2013	10/21/13	1/20/2014	4/14/2014
Acetone	<10	<10	<10	<10 J	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<0.080	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	8.4	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	0.29 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0	<3.0	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	NA	<5.0	<5.3	<5.0	<1.8	<5.6	<4.8	<1.0	<5.0	<10	<10
N,N-Dimethylaniline	<1.0	NA	<1.0	<1.1	<1.0	<0.21	<1.1	<0.95	<1.0	<1.0	<1.0	<1.0
Methanol	<500	NA	<500 J	<500	<500	<500	NA	<1000	<1000	<500	<500	<500

MW-8SR											
Date	4/27/2010	10/12/2010	4/7/2011	10/26/2011	4/12/2012	10/4/2012	4/5/2013	7/25/2013	10/24/13	1/24/2014	4/16/2014
Acetone	<10 [<10]	<10	5.9 J [4.3 J]	<10 [<10]	8.7 J [6.7 J]	<10 [<10]	<10 [<10]	5.1 J [8.7 J]	<10	<10 J [<10 J]	<10 [<10]
Benzene	4.2 [3.5]	2.7	3.2 [3.2]	1.9 [2.0]	1.2 [1.7]	0.69 J [0.70 J]	1.1 [1.1]	1.9 [1.8]	2.9	2.4 [2.6]	3.2 [3.3]
Ethylbenzene	23 J [18]	16	10 [8.8]	2.0 [2.1]	2.3 [3.3]	0.16 J [0.14 J]	0.32 J [0.28 J]	0.17 J [0.18 J]	0.21 J	0.19 J [<1.0]	0.25 J [0.27 J]
Methylene Chloride	<1.0 [<1.0]	<1.0	<1.0 [<1.0]	<1.0 [<1.0]	<0.18 [<0.18]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0	<1.0 [<1.0]	<1.0 [<1.0]
Toluene	4.6 [3.7]	2.0	2.8 [2.6]	1.3 [1.3]	0.76 J [1.2]	0.36 J [0.39 J]	0.67 J [0.68 J]	1.0 [0.96 J]	1.3	0.94 J [1.1]	1.2 [1.1]
Trichloroethene	<1.0 [<1.0]	<1.0	<1.0 [<1.0]	<1.0 [<1.0]	<0.090 [<0.090]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0 [<1.0]	<1.0	<1.0 [<1.0]	<1.0 [<1.0]
Xylenes (total)	41 [33]	31	32 [31]	14 [15]	9.5 [15]	1.4 J [1.2 J]	7.7 [8.0]	11 [9.4]	13	11 [13]	13 [13]
Aniline	370 J [720 J]	220	57 J [64]	<5.0 [<5.0]	<1.9 [<1.9]	<5.3 [<5.0]	<5.1 [<5.1]	2.5 [2.5]	2.6 J	5.1 J [<10]	3.9 J [5.6 J]
N,N-Dimethylaniline	1.0 J [<5.0]	1.6	1.5 [1.6]	2.6 [<1.0]	2.4 [2.6]	2.3 [2.7]	1.7 [1.4]	0.89 J [0.96 J]	0.83 J	2.0 [1.7]	1.4 [1.9]
Methanol	<500 [<500]	NA	NA	NA	NA	NA	NA	<1000 [<1000]	NA	NA	NA

MW-29											
Date	4/27/2010	10/12/2010	4/6/2011	10/25/2011	4/11/2012	10/3/2012	4/5/2013	7/23/2013	10/22/13	1/22/2014	4/15/2014
Acetone	<10	<10	<10	<10	<2.7	<10	<10	<10	<10	<10 J	<10
Benzene	<1.0	<1.0	<1.0	<1.0	<0.080	<1.0	<1.0	0.26 J	0.32 J	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0	<0.18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	0.22 J	<0.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<0.090	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<3.0	<3.0	<3.0	<3.0 J	<0.36	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Aniline	<5.0	<5.2	<5.3 J	<5.0	<1.8	<5.1	<5.1	<1.0	<5.2	<11	<10
N,N-Dimethylaniline	<1.0	<1.0	<1.1 J	0.22 J	<0.21	<1.0	<1.0	<1.0	<1.0	<1.1	<1.0
Methanol	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

LEGEND:

- UTILITY POLE
- CATCH BASIN
- PMO PETROLEUM PIPE LINE MARKER
- GMO GAS LINE MARKER
- HYDRANT
- WATER VALVE
- MANHOLE
- PROPERTY
- LINE EDGE OF WATER
- EDGE OF TREELINE
- TREE
- MW-19 GROUNDWATER MONITORING WELL
- PZ-A PIEZOMETER
- OR DOWNGRADIENT PERIMETER GROUNDWATER MONITORING LOCATION
- MW-8S REMOVED/DECOMMISSIONED GROUNDWATER MONITORING WELL/PIEZOMETER
- APPROXIMATE BOUNDARY OF AREA
- GROUNDWATER WITHDRAWAL TRENCH
- A GROUNDWATER INFILTRATION TRENCH AND IDENTIFICATION
- PIPING TO BUILDING
- PIPING FROM BUILDING
- AREA OF HISTORICALLY RELATIVELY HIGHER CONCENTRATION OF COCs

NOTES:

1. REPLACED MONITORING WELLS ARE IDENTIFIED WITH AN "R" (e.g., MW-24DR).
2. TRENCH LOCATIONS ARE APPROXIMATE.
3. MONITORING LOCATIONS ARE APPROXIMATE.
4. FIGURE ONLY SHOWS CONSTITUENT OF CONCERN (COC) CONCENTRATIONS AT MONITORING LOCATIONS WITHIN THE IMPACTED AREAS AND THE COC PROCESS CONTROL MONITORING LOCATIONS.
5. ONLY COCs WITH CURRENT OR PAST DETECTIONS ARE PRESENTED ON THIS FIGURE.
6. < = COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. THE ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
7. NA = COMPOUND WAS NOT ANALYZED FOR IN THE SAMPLE.
8. J = THE COMPOUND WAS POSITIVELY IDENTIFIED; HOWEVER THE ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED CONCENTRATION ONLY.
9. B = COMPOUND WAS FOUND IN ASSOCIATED METHOD BLANK.
10. THE 6/22/10 SAMPLING EVENT WAS AN INTERIM SAMPLING EVENT ANALYZING FOR VOLATILE ORGANIC COMPOUNDS ONLY.
11. SAMPLE DATA ARE COMPARED TO NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) GROUNDWATER QUALITY STANDARDS (GQS) (TECHNICAL AND OPERATIONAL GUIDANCE SERIES 1.1.1).
12. NS = GQS NOT AVAILABLE.
13. RESULTS FOR DUPLICATE SAMPLES ARE SHOWN IN BRACKETS NEXT TO PARENT SAMPLE RESULTS.
14. RESULTS FROM THE JULY 2013, OCTOBER 2013, JANUARY 2014, AND APRIL 2014 SAMPLING EVENTS REFLECT GROUNDWATER QUALITY CONDITIONS AFTER THE SHUTDOWN OF THE IN-SITU AEROBIC BIOREMEDIATION TREATMENT AND CLOSED LOOP HYDRAULIC SYSTEMS.

SAMPLE IDENTIFICATION

DETECTIONS EXCEEDING NYSDEC GQS ARE INDICATED BY SHADING.

PZ-##							
Date	Jun-06	Jun-07	Mar-08	Mar-09	Apr-10	Jun-10	Apr-11
Acetone	<5.0	<5.0	<5.0	<10	<10	<10	<10
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<4.0	<4.0	<4.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	<3.0	<3.0	<3.0	<1.0	5.3 J	<1.0	<1.0
Toluene	0.50 J	<5.0	<5.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	<5.0	<5.0	<5.0	<3.0	<3.0	<3.0	<3.0
Aniline	<1.0	<5.5	<5.0	<5.0	<5.0	NA	<5.3
N,N-Dimethylaniline	<1.0	<1.1	<0.50	<0.50	<1.0	NA	<1.1
Methanol	<1000	<500	NA	NA	<500	NA	NA

CONCENTRATION (ppb)

NYSDEC GQS (ppb)	
Acetone	50
Benzene	1
Ethylbenzene	5
Methylene Chloride	5
Toluene	5
Trichloroethene	5
Xylenes (total)	5
Aniline	5
N,N-dimethylaniline	1
Methanol	NS

0 100' 200'

GRAPHIC SCALE

McKESSON ENVIROSYSTEMS SITE
SYRACUSE, NEW YORK
MONITORING MEMORANDUM

GROUNDWATER MONITORING DATA SUMMARY FOR APRIL 2010 - APRIL 2014 AREA 3

ARCADIS

FIGURE 4

ARCADIS

Attachment A

Validated Analytical Laboratory Reports

ARCADIS

Attachment B

Statistical Analyses

Attachment B. Statistical Analyses
Monitoring Memorandum, McKesson Envirosystems Site, Syracuse, New York

Discussion of Statistical Results

To evaluate the continued effectiveness of the Operable Unit 2 (OU2) remedial action and the need (if any) to re-start the remedial process, technical analyses were performed to evaluate whether constituent of concern (COC) concentrations: (1) rebound substantially above the pre-shutdown COC concentrations based on an evaluation of the most up-to-date dataset, and (2) continue to trend at asymptotic levels. The technical analyses performed, as described below, are the same as those detailed in the January 2013 Periodic Review Report (PRR; ARCADIS 2013a) and have been updated to include groundwater data through April 2014.

Technical Analyses

To evaluate whether total COC molar concentrations have reached asymptotic conditions (where COC levels are no longer significantly decreasing or increasing), three different analyses were performed using each area's annual data from 1998 to April 2014.[1] The first analysis involved a calculation of overall percent removal of total COC molar concentrations (i.e., moles per liter) from 1998 to 2014. If the overall percent removal during the 17-year period was within 1 percent of complete (100 percent) removal, then it was implied that COC levels approached asymptotic conditions as removal cannot exceed 100 percent.

$$\frac{\text{(Initial Molar Concentration)} - \text{(2014 Molar Concentration)}}{\text{(Initial Molar Concentration)}} * 100 = \%\ \text{reduction}$$

[1]Total COC molar concentrations were calculated for each Area by converting COC concentrations (reported as µg/L) to molar concentrations (i.e., moles per liter), adding together the nine COC molar concentrations (excluding methanol) for each sampling date, and then averaging molar concentrations for the year. The basis for excluding methanol from the technical analyses was detailed in the January 2013 PRR and is presented below.

"Methanol values have been excluded from the analyses in order to accurately portray the temporal trends in COCs at the site. Methanol has a very high detection limit relative to the other COCs evaluated. The methanol detection limit was 1,000 micrograms per liter (µg/L) until 2006 when lowered to 500 µg/L. In the calculation for total COC molar COC concentrations, the use of half the detection limit for non-detects of methanol tends to misrepresent the total COC molar concentration present and confound interpretation of trends regarding COC concentrations.

In Area 1, this problem is most profound due to the low concentrations present compared to the other two Areas. Half the detection limit for methanol represents 17 percent of the initial molar concentration of all COCs present in 1998, and frequently represents more than 95 percent of the calculated COCs present. In Area 1, there have been only six detected methanol concentrations in 137 reported samples (95.6 percent non-detect); five of these six were during 2009, when sample contamination was suspected.

In Area 2, methanol was only detected seven times in 108 reported samples (93.5 percent non-detect), with three of the seven during the September 2009 sampling round when sample contamination was suspected.

In Area 3, there is stronger evidence that methanol was actually present at location MW-8SR in significant levels, as methanol was reported in the 11 samples taken prior to 2002. Since that time, only one of 17 reported samples has yielded detectable methanol concentrations at that location. At the other Area 3 locations, there were a total of three detections (including one in September 2009) in 50 samples."

The second analysis used a first-order decay function [$C_t = C_0*e^{kt}$, where C_t = total COC molar concentration at time t, C_0 = total COC molar concentration in 2002, k = the decay coefficient, and t = number of years since 2002] of total COC molar concentrations from 2002 to 2014 to determine the decay rate, and half-life of COC concentrations in order to evaluate how rapidly COC levels decreased over time. If the COC levels exhibited statistically significant exponential decay over the 12-year period and the percentage of total COCs remaining was relatively small, then it was implied that COC concentrations approached asymptotic conditions.

$$Ln(C_t) = k * Ln(t) + b$$

$$C_t = e^{kt} * e^b$$

$$C_t = C_o * e^{kt}, where\ e^b = C_o$$

$$\text{Decay Rate} = (1 - e^k) * 100$$

$$\text{Half-Life (years)} = Ln(1/2)/k$$

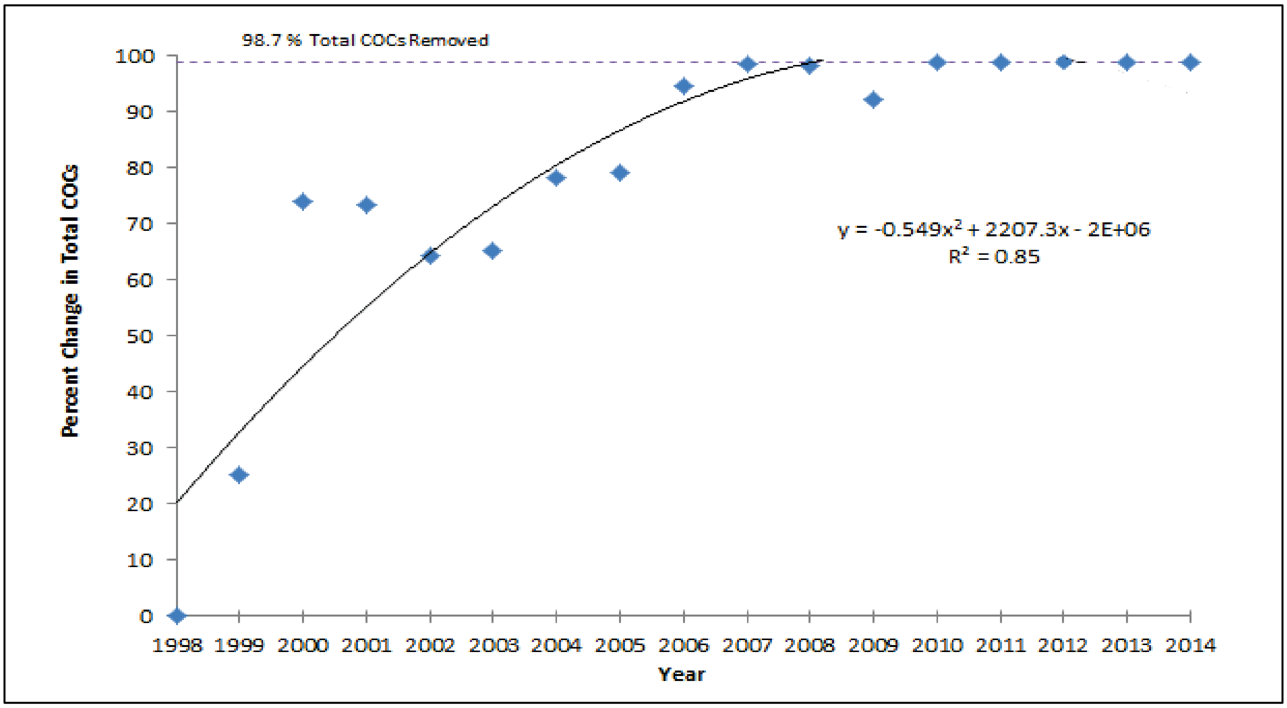
The third analysis involved a linear regression between time (year) and percent reduction in total COC molar concentrations from 2008 to 2014. If the slope of the COC concentrations did not significantly differ from zero, then the data indicate that the asymptote was effectively reached. The data and results of the analyses for each area are described below.

Area 1

Between 1998 and 2014, the overall percent reduction in COC levels in Area 1 (i.e., monitoring wells MW-9S, MW-31, MW-32, MW-33, and TW-01) was 98.7 percent, as shown on Figure B-1. As COC levels were within 1 percent of complete removal (based on two significant figures), the data indicate that COC levels approached asymptotic conditions by 2012 and continued through April 2014.

$$\frac{(2.9E\text{-}05\ mol/L) - (3.7E\text{-}07\ mol/L)}{(2.9E\text{-}05\ mol/L)} * 100 = 98.7\%\ reduction$$

Figure B-1: Area 1 Percent Change in Total COCs



The decay relation [$C_t = 9.09E\text{-}06 * e^{-0.3243t}$] for total COC molar concentrations from 2002 to 2014 indicates that total COC molar concentrations decreased relatively quickly and consistently over the 12-year period, as shown on Figure B-2. The decay coefficient (k) for total COC molar concentrations since 2002 is -0.3243 (probability of occurrence [p] = 8.6E-05, confidence interval [α] = 0.05, correlation coefficient [r^2] = 0.77). This decay coefficient results in a half-life of 2.1 years and a statistically significant annual decay rate of 28 percent per year (95 percent confidence interval ranging from 19 to 36 percent per year). As COC molar concentrations exhibited statistically significant exponential decay with less than 1 percent of total COCs remaining in 2014, the data indicate that COC levels approached asymptotic conditions by 2012 and continued through April 2014.

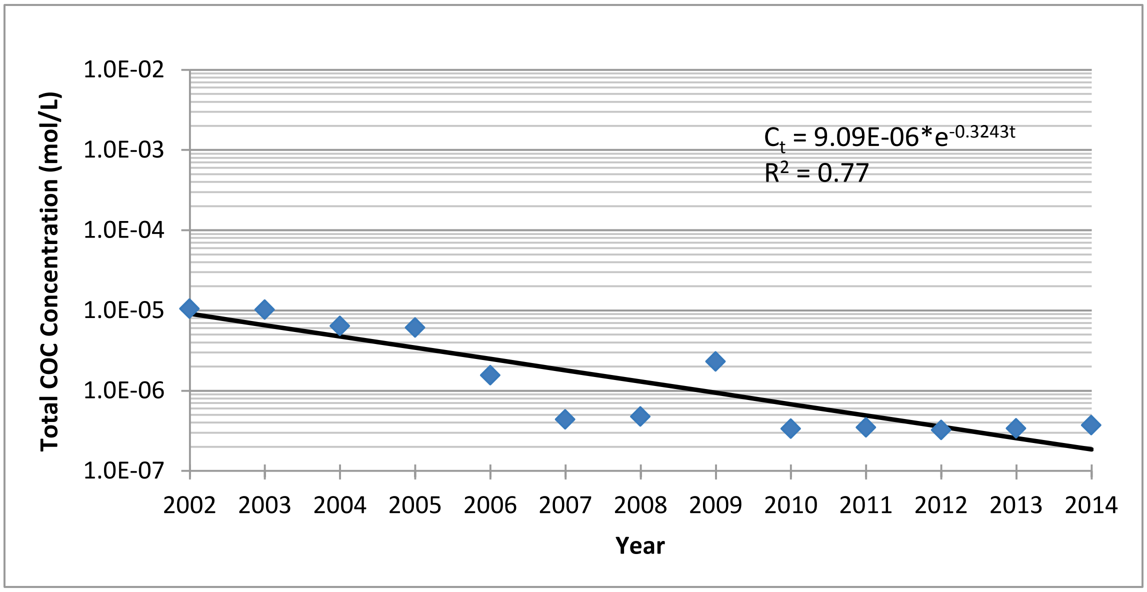
$$Ln(C_t) = -0.3243 * Ln(t) + 637.64$$

$$C_t = 9.09E - 06 * e^{-0.3243t}$$

$$\text{Decay Rate: } (1 - e^{-0.3243}) * 100 = 28\%$$

$$\text{Half-Life: } Ln(1/2)/(-0.3243) = 2.1 \text{ years}$$

Figure B-2: Area 1 Decay Function of Total COC Concentrations



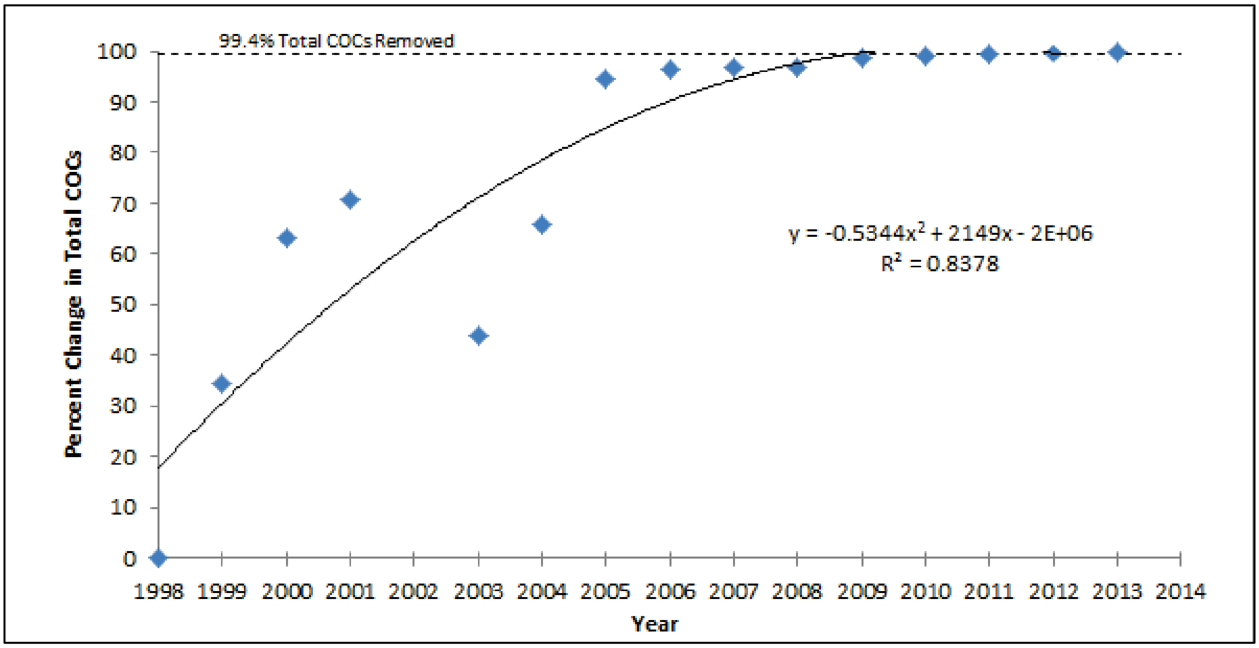
A regression between time (2008 to 2014) and percent total COC reduction further support that COC concentrations in Area 1 approached asymptotic conditions of 100 percent removal. The computed non-significant mean slope of 0.52 percent COC reduction per year ($p = 0.31$, $\alpha = 0.05$, $r^2 = 0.20$), with the 95 percent confidence interval ranging from -0.67 to 1.7 percent per year, indicates that total COC molar concentrations in Area 1 most likely did not significantly decrease nor increase within the last 7 years, suggesting that COC levels effectively reached an asymptote by 2012 and continued through April 2014.

Area 2

The overall percent reduction in COC levels in Area 2 (i.e., monitoring wells MW-36R, TW-02RRR, MW-34, and MW-35) from 1998 to 2014 was 99.4 percent, as shown on Figure B-3. As COC levels were within 1 percent of complete removal, the data indicate that COC levels approached asymptotic conditions by 2012 and continued through April 2014.

$$\frac{(6.1E\text{-}04 \text{ mol/L}) - (3.7E\text{-}06 \text{ mol/L})}{(6.1E\text{-}04 \text{ mol/L})} * 100 = 99.4\% \text{ reduction}$$

Figure B-3: Area 2 Percent Change in Total COCs



In Area 2, aniline contributions dominated the overall COC molar concentrations. The concentrations of constituents other than aniline quickly achieved 99 percent reduction or more in the first few years, while aniline data actually increased, reaching a maximum in 2002. At that time, aniline accounted for approximately 99.7 percent of the total COC molar concentration. Since 2002, Area 2 appears to be approaching asymptotic conditions of 100 percent removal, as noted by the decay function of total COC molar concentrations from 2002 to 2014, as shown on Figure B-4. Using a first-order decay relation [C_t = 4.01E-04*$e^{-0.5011t}$], the total molar concentration of total COCs has an estimated decay coefficient (k) of -0.5011 (p = 1.9E-06, α = 0.05, r^2 = 0.88) with a corresponding half-life of 1.4 years and a statistically significant annual decay rate of 39 percent per year (95 percent confidence interval ranging from 32 to 46 percent per year). After a 12-year period (2002 - 2014), 0.23 percent of the total COC molar concentration remained. As COC molar concentrations exhibited statistically significant exponential decay with less than 1 percent of total COCs remaining in 2014, the data indicate that COC levels approached asymptotic conditions by 2012 and continued through April 2014.

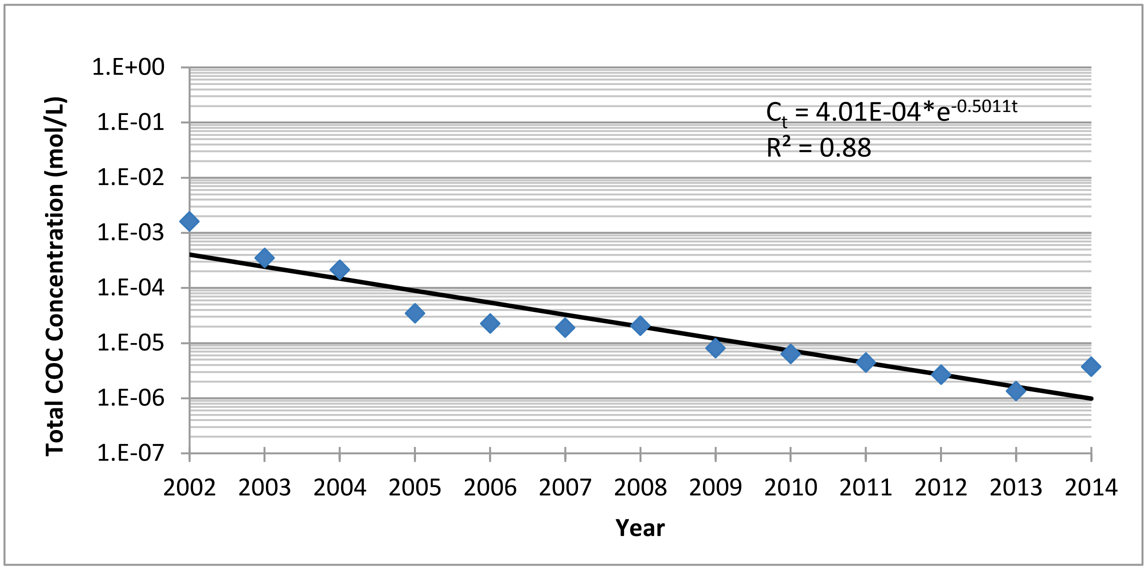
$$Ln(C_t) = -0.5011 * Ln(t) + 995.38$$

$$C_t = 4.01E - 04 * e^{-0.5011t}$$

$$\text{Decay Rate: } (1 - e^{-0.5011}) * 100 = 39\%$$

$$\text{Half-Life: } Ln(1/2)/(-0.5011) = 1.4 \text{ years}$$

Figure B-4: Area 2 Decay Function of Total COC Concentrations



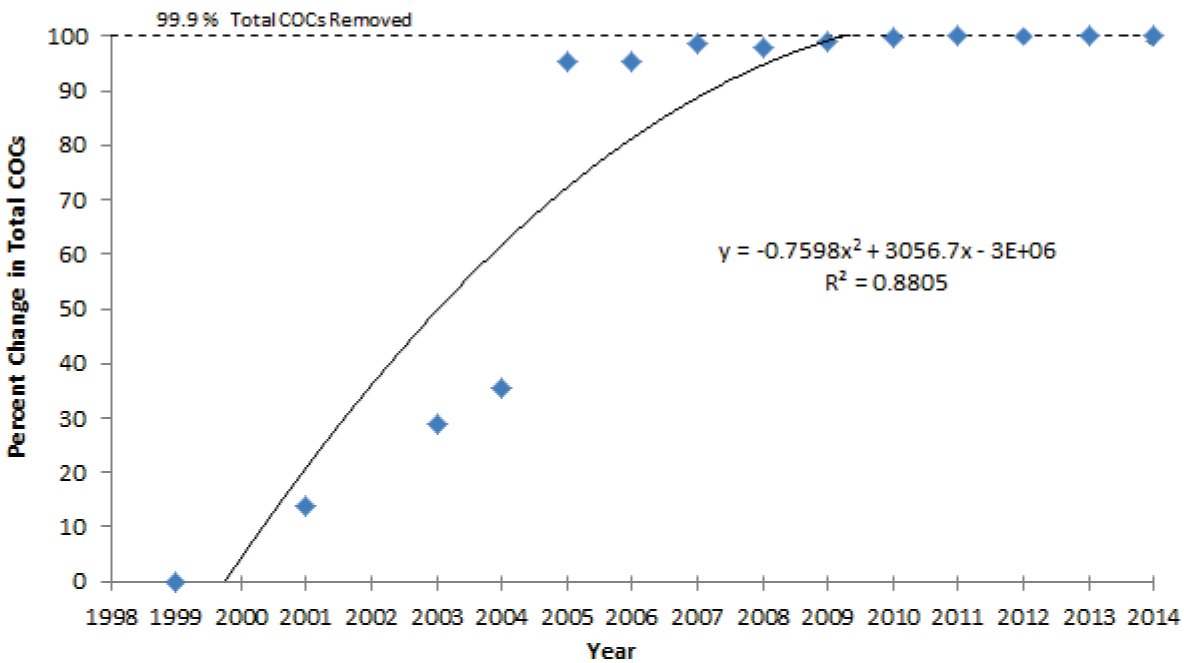
The regression between time (2008 to 2014) and percent total COC reduction indicates a continuing slight positive statistically significant mean slope of 0.39 percent reduction per year ($p = 0.030$, $\alpha = 0.05$, $r^2 = 0.64$), with the 95 percent confidence interval ranging from 0.057 to 0.73 percent per year. Despite this minor increase in the percent reduction in total COC molar concentration, Area 2 appeared to be approaching asymptotic conditions by 2012 and continued to trend at asymptotic levels through April 2014, as noted by the lower end of the 95 percent confidence interval approaching zero percent COC reduction per year, the rapid decay rate, and the high degree of total COC removal within the last 5 years (>98.9 percent).

Area 3

The overall percent reduction in COC levels from 1999 to 2014 in Area 3 (i.e., monitoring wells MW-8SR, MW-27, and MW-28) was 99.9 percent, as shown on Figure B-5. As COC levels were within 1 percent of complete removal, the data indicate that COC levels approached asymptotic conditions by 2012 and continued through 2014.

$$\frac{(4.1E\text{-}03\ mol/L) - (2.5E\text{-}07\ mol/L)}{(4.1E\text{-}03\ mol/L)} * 100 = 99.9\%\ reduction$$

Figure B-5: Area 3 Percent Change in Total COCs



COC molar concentration data were erratic prior to 2002, when aniline, N,N-dimethylaniline, and methylene chloride were major contributors. N,N-dimethylaniline and methylene chloride were essentially gone (>99.9 percent removal) by 2005. The decay relation [$C_t = 7.68E\text{-}03 * e^{-0.9147t}$] for total COC molar concentrations from 2002 to 2014 supports that COC molar concentrations in Area 3 rapidly decreased over the 12-year period, effectively approaching asymptotic conditions of 100 percent removal by 2012 and continuing through April 2014, as shown on Figure B-6. The decay coefficient (k) for total COC molar concentrations is -0.9147 (p = 1.03E-08, α = 0.05, $r^2 = 0.95$), with a half-life is 0.76 years and a statistically significant annual decay rate of 60 percent per year (95 percent confidence interval ranging from 54 to 65 percent per year). After a 12-year period (2002 to 2014), 0.0051 percent of the total COC molar concentration remained. As COC molar concentrations exhibited statistically significant exponential decay, with less than 1 percent of total COCs remaining in 2014, the data indicate that COC levels approached asymptotic conditions in 2012 and continued through April 2014.

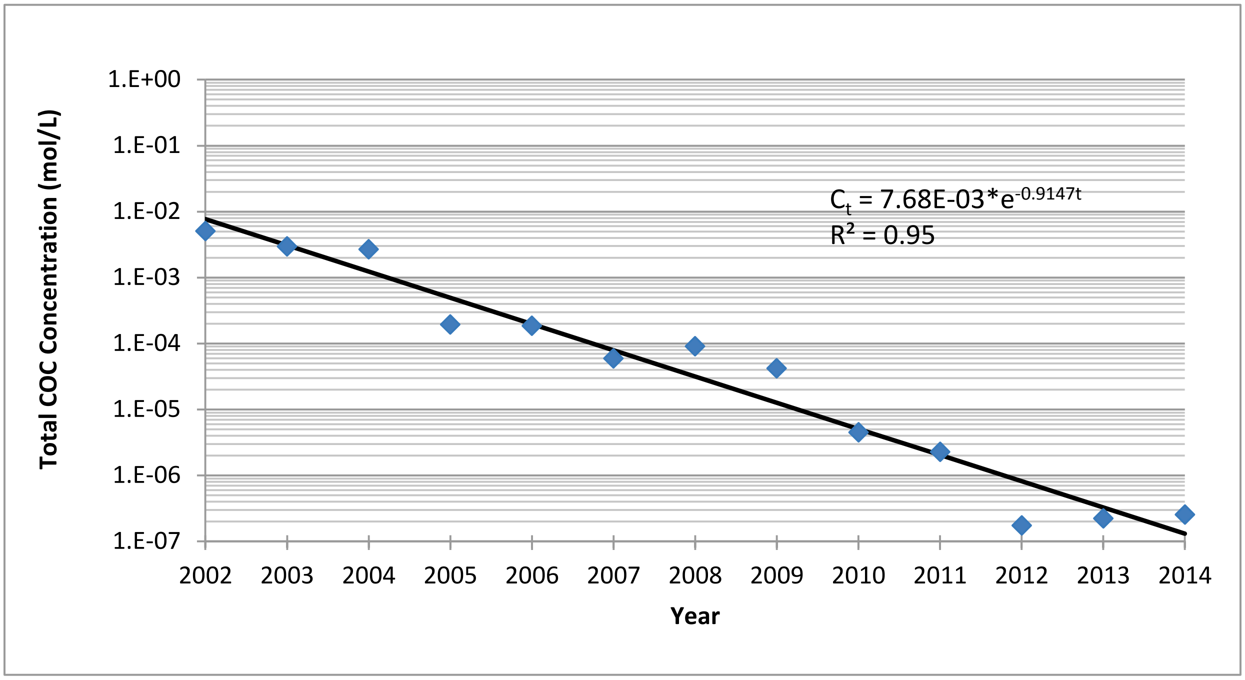
$$Ln(C_t) = -0.9147 * Ln(t) + 1826.4$$

$$C_t = 7.68E - 03 * e^{-0.9147t}$$

$$\text{Decay Rate: } (1 - e^{-0.9147}) * 100 = 60\%$$

$$\text{Half-Life: } Ln(1/2)/(-0.9147) = 0.76 \text{ years}$$

Figure B-6: Area 3 Decay Function of Total COC Concentrations



The regression between time (2008 to 2014) and percent total COC reduction indicates a continuing slight positive statistically significant mean slope of 0.31 percent COC reduction per year ($p = 0.031$, $\alpha = 0.05$, $r^2 = 0.64$), with the 95 percent confidence interval ranging from 0.042 to 0.58 percent per year. Despite this minor increase in the percent reduction in total COC molar concentrations, Area 3 approached asymptotic conditions in 2012 and continued to trend at asymptotic levels through April 2014, as noted by the rapid decay rate and the high degree of COC removal within the last 5 years (>99.9 percent).